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THE PREVENTION OF HOSPITAL INFECTION OF WOUNDS.[1]

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HOSPITAL INFECTION of wounds is a unique subject, in that it concerns not this or that branch of the medical profession, but almost all branches, and not only the medical profession, but almost all hospital personnel. It is unique also, in that surgeons who open the discussion on hospital infections of wounds, are not necessarily authorities by virtue of a large experience of the subject among their own patients.

Recently, war has stimulated thought and research on the subject, and provided for our earnest attention abundant material—so abundant, in fact, that I can deal with only a few highlights, in rather dogmatic fashion. But I would remind you that my bald statements have a sound background of controlled experiment and clinical and bacteriological investigations, the key to which I am leaving in a small list of references at the end of my address.

The Frequency and the Fruits of Hospital Infections.

How often do clean surgical wounds become infected through hospital contamination? Estimates based upon extensive investigations vary from 5% to 15% of cases. The percentages are much higher in accident wards filled with patients who have open and discharging wounds.

The fruits of this infection vary from a slight delay in the healing of the wounds to the death of the patient. Leriche has made the extraordinarily attractive suggestion that, apart from its obvious clinical pyogenic effects, contamination of wounds, if of small degree, may result in masked or imperfect infection, incapable of clinical detection, but having on tissues effects which hitherto we had not ascribed to the real cause. He reminds us of the wounds that widen out, or which develop keloids; of wounds which become painful and blue, or develop a hard, sclerotic substratum; of wounds that give way, perhaps months afterwards, causing a hernia; of peritoneal adhesions, phlebitis and embolism. Cairns, by the way, has no doubt about the importance of low-grade, air-borne infections as a cause of meningeal adhesions, which may themselves prove fatal by interfering with the circulation of cerebro-spinal fluid.

Resistance of the Tissues.

Dead tissue falls an easy prey to microorganisms. Damaged tissue has a lessened resistance. Therefore, one great duty of the surgeon in preventing hospital infection is to cherish the body tissues, and to treat them in such a way that they can exercise to the full their natural powers of resistance. This means (i) minimizing trauma and (ii) aiding the circulation of blood and of lymph.

At operation, bruising, rough handling and tension must be avoided, hæmostasis must be thorough and hæmatomata must not be left in wound spaces. During after-treatment, the injured part must be rested and supported and saved from the trauma arising from its own helplessness. This often means the purposeful and intelligent use of splints.

The injured part, head or extremity, must be elevated. Elevation helps the tissues to overcome established infection, and, *a fortiori*, it helps to prevent infection. The part is not elevated unless it is comfortably supported above the level of the heart. The patient does not elevate a leg by sitting in a chair with the injured leg upon another chair, nor even by going to bed and propping himself up on pillows so that he can read the newspaper. He must lie down and the pillows must be taken from the head and placed under his leg. A Braun splint is better than pillows, for the leg does not roll off. Again, a hand is not elevated when held across the abdomen by a sling. Even if the hand is held on the opposite shoulder, the

[1] Read at a meeting of the New South Wales Branch of the British Medical Association on September 30, 1943.

elevation is not effective, because the veins in the cubital fossa are compressed. Every now and then a patient is admitted to hospital with an infected hand or foot, because after treatment of his original injury (perhaps in the casualty department) he was allowed to go home, and to go with no instructions. Rest and elevation of the part above heart level often suffice to effect a cure, and would have prevented infection if they had been used. The head is elevated by placing the patient in the Fowler position (Figure I).

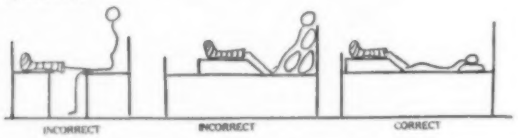

FIGURE IA: Lower limb.

Finally, the tissue resistance can be improved by general measures, blood transfusion, chemotherapy *et cetera*, as indicated.

Back to Lister.

Lister looked upon the air as being an important source of contamination and he used sprays. But other factors proved to be more important in the early days of antiseptic surgery, and the correction of these led to a dramatic improvement in results—so dramatic that the air came to be neglected for a time. But now, contamination from the air is known to play a major role in present-day hospital infection in wounds.

The Chief Reservoirs of Hospital Infection.

The chief reservoirs of hospital infection are human throats, noses and skins, and wounds which are themselves infected. *Streptococcus pyogenes* normally inhabits from 5% to 30% of human throats and occasionally the nose; *Staphylococcus pyogenes* lives in from 20% to 40% of human noses, and on 10% to 20% of human skins. The nose is probably the primary source of the staphylococcus, which infects not only the wound of the patient, but also the skin of the carrier. Those who are not permanent carriers of pyogenic organisms in pharynx or nose may become temporary carriers.

From these primary reservoirs, infection is transferred to the secondary reservoirs, the dust on the floor and other surfaces, the blankets, the soiled dressings of wounds including plaster casts, and all the instruments and equipment used in a hospital ward or theatre.

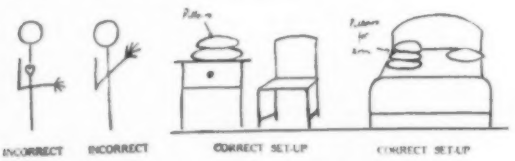

FIGURE IB: Upper limb.

The bacterial flora of these depots become interchangeable so that a streptococcus from a throat can infect a wound, and streptococcus from a wound can infect a throat; a throat can contaminate or even infect a finger, and the finger then infects a wound. Infection may be aggravated not only by the addition of one species of germ to another, but even by the addition of one strain of streptococcus to a different strain.

The bacterial content of the air reaches its peak during sweeping and bed-making and the removal of pus-soaked dressings or plaster casts.

The two great vehicles by which bacteria are conveyed from their reservoirs to the wound are contact and air. The second of these conveys droplets and dust. Some of those methods which have proved effective in preventing this transference may now be touched upon briefly. Many routine procedures, such as methods of sterilization, must be left undiscussed.

Contact Infection and Rubber Gloves.

There is no need for me to elaborate upon the importance of rubber gloves in reducing infection in wounds. I sometimes think, and not without evidence, that our ear, nose and throat colleagues could reduce the incidence of secondary hæmorrhage following tonsillectomy by using gloves more often.

Glove punctures are responsible for the infection of clean wounds with *Staphylococcus aureus*. If gloves, before being put on, were filled with spirit or some lubricant less damaging to the skin, it might be possible to reduce the bacterial contents of the glove during the operation. An investigation of this possibility may prove an interesting and useful piece of research for a Fellow in Surgery.

Baths and Arm-Baths.

Baths and arm-baths must have neither surface defects nor crevices. They are sterilized by "Lysol". Even when all precautions are taken, and in spite of the teaching of Kanavel, I have never felt safe in using arm-baths in the post-operative care of infected hands. Many of these infections, especially those in the tendon sheaths, are purely streptococcal, and I believe that even a clean arm-bath may introduce a secondary staphylococcal infection from the patient's own skin.

I have treated these lesions by the closed method, paying great attention to rest and elevation of the part. In 1940, Iselin, the French authority on infected hands, advocated a similar method.

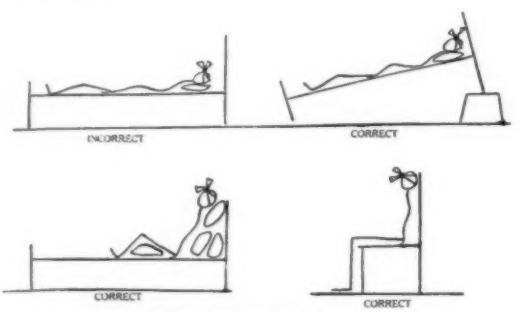

FIGURE IC: Head and neck.

Droplet Infection, Masks and Masking.

There is no longer any excuse for using the old-fashioned type of gauze or muslin mask. The only type of mask which should appear in our operating theatres and wards is one designed as a pocket into which is slipped a sheet of "Cellophane" or stiff paper. If the "Cellophane" is coloured, it can more easily be seen, and any doubling over will be more readily noted and adjusted. This mask must be at least six inches by eight inches in size.

The nose and mouth must be covered. To cover only the mouth and then to breathe through the nose is unreasonable. John Staige Davis made the following statement:

> When we realize that microorganisms are being constantly showered from the nose into the wound during ordinary respiration, it is appalling to see an operator and his first assistant with nose uncovered, breathing into an open abdomen, or an exposed brain, or a wide open breast defect, or any other wound for, say, an hour or longer. Would any of you care to be exposed to this unnecessary risk if you were the patient?

Fogging of spectacles may be prevented by moulding the upper edge of the mask well into the side of the nose, and by passing the upper pair of tapes below the ears, and tying them on top of the head.

The rule "keep your mouth shut" is a fitting corollary to adequate masking. More bacteria are ejected and more air currents are set up at the sides of the mask when one talks, still more, of course, when one coughs. Do not chatter in the operating theatre.

The cap and mask, by the way, should be put on before the sterile gown is donned; otherwise the gown may be contaminated by dust from the head, by the breath, or by the strings of the mask. For sterilizing, the gown should be folded in its canister, inside out, so that when it is picked out, only the inside is touched.

The Patient and the Anæsthetist.

The patient must be protected from himself, and here the anæsthetist plays his part. A scene such as the following frequently threatens and must be forestalled by the surgeon. The abdomen is uncovered, and a sterile sheet is placed over the lower limbs; this is the moment frequently chosen by the careless or half-trained anæsthetist to remove the mask from the patient's face, perhaps just to observe breath-holding or laryngeal spasm, perhaps to struggle with airway or Magill tube. In any case, the result is often violent breathing or even coughing by the patient, and the curve of the pharynx or of the tubes is such as to project a heavily infected shower of droplets right over the operation area, or perhaps, if the head is turned a little to one side, over the sterilized operating equipment. I have even witnessed such a horrid performance after the surgeon had made his incision. The best method of ensuring protection from this danger is to make use of the anæsthetic screen, at least for operations below the clavicle. The bow or frame is placed in position before the part is uncovered, and the sterile sheet for the head end of the patient is the one first placed in position.

The sterilization of anæsthetic apparatus, especially the masks and tubing of machines for the closed method of inducing anæsthesia, should be seen to by the anæsthetist. Carelessness in this respect may result in the conveyance of respiratory infection, even tuberculosis, to the patient.

In the ward also the patient must not be allowed to contaminate his own wound, and his head must be turned away or he must be masked during a dressing. Some years ago I experienced in two cases infection at the upper end of radical breast incisions. I suspected that the patients had turned their head and watched the removal of the tube. Since then I have brought drainage tubes with their anchoring silkworm loops through the dressings so that they can be removed without disturbing the deeper dressings. A continuous suture is used for the wound, so that nearly all sero-sanguineous discharge passes through the drainage tube and does not make the deeper dressings stiff and uncomfortable. Since that time I have had no infection in breast wounds.

A Ward Dressing Technique.

The completely sutured wound, as in most civilian cases, should not be uncovered until it is healed and ready for removal of sutures. Never mind about the little serous effusions, which will be absorbed or discharged automatically. Do not probe and squeeze. Prevention of ward infection in this group of cases is a simple matter.

But, when the ward is filled with patients who have open wounds—the road accidents of civil life, or war wounds—the problem needs more care. Sodden dressings or plaster casts are no protection against secondary infections and are themselves a rich source of infection. To add infections to an already infected wound may have grave consequences. It is therefore necessary in these wards to adopt a careful routine. Such a routine may be found detailed in papers by Professor Miles and his colleagues, and in the Medical Research Council's War Memorandum Number 6. These should be read and assimilated by every surgeon and every senior surgical nurse. I have found it useful to give copies of them to senior nurses. Sterilized forceps and masks play a great part in this routine. Fingers and dust and droplets are kept away from wounds and dressings, and even away from the skin adjoining a wound.

The Nursing Staff.

The intelligent cooperation of the nursing staff is important. This may be best encouraged by providing the nurses with a short course in bacteriology, not with lectures, but with practical work, which easily holds their interest. They handle swabs and make cultures from various objects—nose, throat, floor, plaster casts *et cetera*—and examine these cultures. Probably three or four lessons would be sufficient.

Dust and the Cleansing of the Air.

Bed-making, removal of plaster casts, draughts, the opening and closing of doors, traffic, the shifting of rubber floor mats, the use of hair-driers for burns, all these increase air-borne contamination. Floors should never be swept by the dry method. They should be oiled (for example, with spindle oil) or cleaned with an oily rag, or wet paper or tea-leaves or sawdust. After the ward has been cleaned, it should be well ventilated for at least thirty minutes before dressings are removed from wounds.

Air-conditioning and filtration are one of the provisions required in the modern operating theatre. The air is freed from dust by filtration and by washing and is driven into the operating theatre through vents near the ceiling. Ultra-violet light is used in a few operating theatres to sterilize the air. And most interesting of all is the attempt by Gudin and others, by using a series of sterile rooms, and completely covering the operators, to work in a completely aseptic environment, so that swabs can even be picked up off the floor and used with safety.

Plaster Casts.

Plaster casts applied over wounds are a rich source of pathogenic bacteria. When the discharge soaks through them and dries on the outside, the cast will contaminate the bedclothes, the hands and anything else with which it comes in contact. The following remarks are taken from the Medical Research Council's War Memorandum Number 6:

Closed plasters on wounds should be opened in a special plaster room and not in the ward.

Plaster shears must be boiled immediately after use on each plaster.

Persons opening plasters should wear masks and gloves.

Plasters must be moistened while being opened.

Plasters which are becoming dirty and soft may be wrapped in some sterile absorbent material, which must be changed frequently, to prevent pollution of the bedding, etc.

The discarded plaster must be placed at once in a closed bin. If the plaster has to be carried out of the room to the bin, it should first be wrapped in a damp sheet, which must be disinfected after use.

The board or plate on which fresh plaster bandages are spread must not be contaminated with soiled plasters or plaster shears.

Blankets.

Blankets are a potent cause of air contamination. One notes with horror the heavy cloud of dust appearing over the patient's abdomen, in the beam of the operating theatre light, when the blankets are adjusted. And these blankets are probably never sterilized, and no one knows

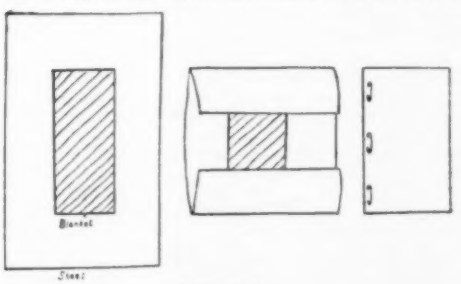

FIGURE II.

what flora they have acquired in the last few weeks from the noses and throats and wounds of previous patients. Hæmolytic streptococci can survive, dry, in dust for ten days or more. The problem of blankets has not yet been solved. The Medical Research Council is investigating their treatment with oil, but has not yet devised a method

for general use. Into the theatres of the public hospitals in which I operate, no uncovered blanket is allowed to enter. The ward blanket which covers the patient on his trolly-ride is removed outside the operating theatre and replaced by the theatre blanket. The theatre blanket is wrapped in a sheet, and fixed with three safety pins, as shown in the illustrations. The width of the sheet must be three times the width of the blanket (Figure II). I think that a similar method could be used in the wards; perhaps blanket-slips made like pillow-slips could be employed. Mattresses should be enclosed in washable covers.

The Hernia Wound.

Infection occurring in a hernia operation, or in any other "clean" case, must in general be looked upon as a reproach to the surgeon and to his team. A bacteriological investigation should be made and the team should do no further operating until the routine has been critically reviewed and laxities have been corrected.

The Incision over a Vein.

It is sometimes noted that a patient recovering from a major operation is still troubled by a painful and discharging wound in the arm or leg, long after the main wound has healed. It is natural to associate this annoying experience with the careless practice of cutting down upon a vein without observing aseptic precautions—no gloves, no cap, no mask—as though there were no need to bother, because it was only a small wound. But it is big enough to receive staphylococci from the operator's skin, droplets from his nose and throat, and dust from his hair.

"An Affair of the Spirit."

Moynihan described surgery as "an affair of the spirit", a spirit which is always restless and striving after higher things, not puffed up by the 99 successes, but much concerned about the one failure.

There are two dangers. The first is complacency, or the feeling that one's results are good—a feeling not arising out of the study of carefully documented records, but based upon memories or impressions, rather like the golfer, who tells stories of his wonderful rounds, but never really keeps a card.

The second danger is a failure to recognize hospital infection when it does come, and the tendency to attribute the added fever to "unavoidable accident" or to "pocketing", whereas it is in fact due to "an inadequate routine" or to "an adequate routine inadequately performed".

The best results in surgery (that is, amongst those who have really "kept cards") have been achieved by those who took great pains. Moynihan, the Mayos, Cushing, Arbuthnot Lane and Harry Harris would not tolerate laxity, even in the smallest detail of aseptic technique.

Conclusion.

Let me conclude with a prescription for the prevention of hospital infection of wounds:

℞

Bacteriology ..... a small part
Care ..... a large part
Golden rule ..... sufficient to flavour
Misce.

Signetur.—Apply to every wound as you would have it applied if the wound were your own.

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[1] This list is by no means complete, and important publications have been omitted; but it is sufficient as an introduction.

HOSPITAL INFECTION OF WOUNDS.[1]

By R. L. STEPHEN,
Sydney.

IN 1919 Fleming and Porteous (*The Lancet*, Volume II, 1919, page 49) found that streptococci could be recovered from 15% of wounds at casualty clearing stations during the last war, but that a week after the casualties' admission to base hospital the percentage had risen to 90. In 1940, Niles and others, in an article on "Hospital Infection of War Wounds" (*British Medical Journal*, December, 21, 1940), stated that "in a series of seventeen air-raid wounds sampled within 48 hours of injury, a colony of hæmolytic streptococci was obtained in one wound. Yet it is not unusual to find, as we have, that 70% of the wounds in a ward are infected with streptococci pyogenes".

After almost a quarter of a century of modern medicine, then, the danger of hospital infection is practically the same as it was towards the end of the last war. Fortunately, this problem is now receiving greater prominence, and more thought is being given to its solution.

In the wards, the three main sources of danger of wound infection are contact, droplet infection and dust, and the danger of cross-infection of wounds is increased with every patient with a "dirty" wound who is admitted. From an orthopædic viewpoint, this increased danger arises mainly from open wounds to limbs, the result, generally, of street or machinery accidents. It may be worthwhile, therefore, to outline the procedure adopted in such cases. Immediately on arrival, the casualties should be taken to anti-shock rooms and kept there until they are fit for operation; they should not be admitted to a surgical ward. During this waiting period, an attempt at preventing the establishment of infection is made by the application of a suitable antiseptic agent. Proflavine (1:1,000), since it is efficacious in the presence of blood and is of low toxicity, is the antiseptic agent of choice.

No application of antiseptic, however, can be allowed to serve as an excuse for inadequate *débridement*, and all further attempts at preventing the establishment of infection are carried out in the operating theatre. Here, the wound and skin are cleaned by being scrubbed with a soft brush, soap and water being used, the skin is dried with spirit, and iodine is applied. Different surgeons, of course, prefer different antiseptics; but according to Coleman (*Bulletin of War Medicine*, Volume II, Number 2, 1941, page 78), iodine, pure "Dettol" and "Chloramine T" (1:100) are the best for skin disinfection, in that they produce a bactericidal film which is effective for several hours. After this toilet, the wound edges are excised and any visible foreign bodies are removed. All concerned then change into fresh gowns and gloves, fresh instruments are supplied, the wound is enlarged and a thorough *débridement* is carried out. Sulphanilamide powder is then insufflated into the wound. Finally, the skin wound is sutured when this can be done without tension, and if the accident has not occurred more than six hours previously, any unsutured areas are packed with "Vaseline" gauze and a plaster cast is applied; antitetanic serum and gas-gangrene antiserum are, of course, given as

[1] Read at a meeting of the New South Wales Branch of the British Medical Association on September 30, 1943.

a routine measure. The ideal thing to do would be to nurse each of these patients in a separate room, but as this is economically impossible, they must be taken to the wards. Such wards should have adequate bed spacing, and should not contain more than four beds. Whilst the patient is in the wards, sulphanilamide therapy by mouth is instituted and continued until the temperature has remained normal for several days, provided that the blood picture allows of this procedure.

If the foregoing treatment is carried out, one has at least made a serious attempt at preventing the introduction of a fresh focus of infection into the wards, and the patient has been brought to a condition in which he will be fit to do battle with the dangers which there await him.

The Operating Theatre.

Unfortunately, there are the occasional "clean" cases in which the disaster of infection occurs at operation. Although a few of the causes may be beyond the surgeon's control (for example, contaminated catgut), most are due to errors in operating theatre procedure. This, then, will be briefly dealt with.

"Scrubbing Up."

According to Colebrook (*loco citato*), ordinary household soap has a bactericidal action, and the more concentrated the lather, the more effective is this action. He therefore recommends that one should "scrub up" in a comparatively small volume of still water (three or four pints) with plenty of soap for five minutes, and not in running water, as many of us have been accustomed to doing. Probably the safest way would be to follow this advice, and then finally to rinse the hands in sterile running water.

Masks and Caps.

Most masks, in addition to having too few layers of gauze, or no impervious layer, are too small. They should come well up over the nose, and extend down beyond the chin and around to the ears. A good pattern is given in Medical Research Council Memorandum Number 6. Caps are frequently worn, particularly by the nursing staff, with a quantity of hair showing on the forehead. Should an accidental bumping of heads occur, there is a real danger that any loose hair will be dislodged onto the operating field.

The Actual Operation.

All surgical work, of course, is done by instruments; the hands do not touch the patient at all. Two other points are worthy of consideration. Firstly, all operations should be performed in air-conditioned operating theatres. This is not only more comfortable and therefore more conducive to good work, but is safer from the point of view of air infection. For, according to Macbeth (*British Medical Journal*, March 27, 1943), recently conditioned air contains only 10% of the organisms found in unconditioned air. (In passing, it may be stated that experimental work is now being done to sterilize air with germicidal aerosols and with ultra-violet rays. This, however, is still only in the experimental stage.) The second point is that in non-urgent cases, the general health of patients should be made as good as possible before operation, so that whatever danger of autoinfection may exist will be minimized.

The Wards.

We have now done what we can to prevent the transference of foci of infection to the wards, and must attack the problems which await us there.

Dust.

Various methods are used to combat the danger of dust. One method is to replace sweeping by vacuum cleaning. If heavy duty vacuum cleaners are used at regular intervals, and ordinary household ones are used daily, then the dust menace is greatly reduced. The dusting of lockers *et cetera* should be done gently and with a moist duster.

Bed-making is to be carried out as gently as possible. Thomas and van der Ende have shown that tremendous numbers of organisms are projected into the air every time a bed is made, and they have further shown that if bed-clothes are treated with 30% liquid paraffin in white spirit, these numbers are reduced by 95%. The same authors suggest that floors be treated with spindle oil, to prevent dust from rising during sweeping operations (*British Medical Journal*, June 28, 1941).

As the domestic activities of a ward disturb the dust, no dressing should be done until at least an hour after all ward-cleansing activities have ceased. Further, all doors and windows should be closed, and traffic through the ward should be prohibited. Bed-clothes, of course, are to be disturbed as little as possible.

Droplet Infection.

Adequate masks should be worn by all engaged in dressings, and silence should be maintained as far as possible. If patients insist on talking, they should also be masked. Anyone suffering from an upper respiratory tract infection should, of course, be excluded from the ward.

Contact.

The danger of infection through contact is ever present unless a strict dressing routine is carried out in all cases. An essential fact to remember is that the shorter the time for which a wound is uncovered, the less is the danger of its becoming infected. It follows as a natural corollary that wounds should never be uncovered unless there is a positive indication. Further, a skilled assistant is necessary to shorten the dressing time.

Both dresser and assistant, having washed their hands well, dry them. If the hands are not dried, the drippings from them contain bacteria from the skin, and from these the wound may become infected. All the work of the actual dressing, after removal of the outer layers, is done by instruments. It is, therefore, unnecessary to "scrub up" to the point of surgical cleanliness.

The routine is as follows. The dresser removes the outer bandages by hand, then washes and dries his hands. Whilst he is doing this, the assistant opens the dressing packet for him. The dressing of the wound is then carried out by the dresser, who, using instruments, removes the inner layer of dressings, and then, using the same forceps, removes any slough, stitches *et cetera* which require removal. Anything removed, whether old dressing, stitches or slough, is put into a covered container. A second assistant is helpful here, as the first assistant must handle only sterile dressings or instruments, and those with sterile forceps. Should the dresser have to put aside his dressings forceps temporarily, they are stood in a sterile container, not laid on a dressing towel, until he needs them again.

When the wound toilet is completed, the new inner dressing is applied by the dresser, still using the same forceps, which are then finally discarded and the bandages applied. The dresser then again washes and dries his hands, whilst the assistant removes used articles from the trolly and reboils used instruments. He in turn then washes and dries his hands, and the team goes on to the next patient.

For each patient, an individual dressing packet should be prepared—not dressings in bulk in drums for a series of patients. All sterilization, when possible, should be done by heat; dressings should be sterilized in the autoclave and instruments boiled. Boiling, unfortunately, does not kill spores; but it is impractical to autoclave instruments for each dressing, and antiseptics are not to be relied on. In the few instances in which the use of heat is impracticable (for example, for ward baths), the antiseptic agent must be sufficiently strong, and approval and advice as to method of use should be sought from the hospital bacteriologist.

Plaster Casts.

There still remains the question of wounds enclosed in plaster. The exudate from these wounds softens the plaster, and bacteria can soak through. Unfortunately, to obtain good results in the treatment of the primary condition, it is generally necessary to refrain from changing the plaster cast except at infrequent intervals. In such cases, the best that can be done is to wrap the cast in some absorbent material which can be changed as often as necessary.

When a plaster cast is to be changed, the following precautions should be observed: (i) The change should be made in the plaster room, and not in the ward. (ii) Shears should be boiled immediately after use. (iii) All concerned should wear mask and gloves. (iv) The cast should be moistened before it is cut.

Conclusion.

To improve the position in regard to hospital infection, it is essential that all concerned should understand the reason for its occurrence and grasp the importance of attention to details. In this connexion, a closer cooperation between the teaching staff, the bacteriologist and the nursing staff should result in great improvement. The foregoing consideration of the prevention of hospital infection in the wards is largely taken from the Medical Research Council Memorandum Number 6, in which minute instructions are given.

THE PREVENTION OF HOSPITAL INFECTION OF WOUNDS.[1]

By COLIN WHITE,
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IN the war of 1914 to 1918 sepsis was recognized as the chief cause of complications in the healing of wounds, but the source of the infection was not accurately known. It was usually assumed that pyogenic bacteria were carried into the wound at the time when it was inflicted. It is now known, as a result of studies carried out during and just prior to the present war, that many wounds are infected in hospital.[2] The organisms are transferred from one patient to another, or from the staff to patients. Those with large wounds such as burns are especially exposed to secondary sepsis; in one investigation it was estimated that 5% of a series of burns were infected initially and that a further 65% became infected in hospital. The War Wounds Committee of the Medical Research Council recently found that 70% of the war wounds being treated in London hospitals were infected. In the light of present knowledge it can be assumed that the vast majority of these infections were of the "hospital" type.

The possibility of cross-infection in a surgical ward will be readily appreciated by the obstetrician or by a doctor who has worked in a hospital for infectious diseases; they have both seen a similar transfer of organisms take place among their own patients. The surgeon, however, is not so likely to be convinced as a result of his experiences in peace time. Striking cases of cross-infection are then rare and may be attributed to an unavoidable accident. The infections caused are seldom fatal or otherwise spectacular, and many are so mild and non-specific that the clinician finds no difficulty in explaining them without incriminating the method of hospital management. In the handling of war casualties, however, cross-infection becomes more obvious. Further, the process is a cumulative one, since the larger the number of patients with infected wounds, the greater are the opportunities for the spread of infection.

The demonstration of hospital infection has been carried out in two ways. It has been shown that fresh wounds are frequently sterile, whereas infection is often widespread when the same wounds are subsequently examined in hospital. It may be held that the organisms have merely increased in numbers and so become more obvious. Against this, however, is the fact that it is sometimes three weeks before the hæmolytic streptococcus is recovered from a wound, and this organism does not usually lie in a wound without developing. A second line of evidence comes from the tracing of indicator organisms in their passage through a ward. Hæmolytic streptococci are followed in these investigations, because, although the staphylococci are commoner, the streptococci can be divided into some thirty types, and so an individual type is easily traced. In one typical case a patient with type XII Group A streptococci entered hospital. Within a short time, the wounds of fourteen patients were found to have acquired type XII Group A streptococci. In six of these cases skin grafts failed and in some of the others cellulitis and delayed healing occurred.[1] No surgeon could have such an experience without being moved to action.

[1] Read at a meeting of the New South Wales Branch of the British Medical Association on September 30, 1943.

Channels of Infection.

In order to appreciate the methods of preventing hospital infection, it is necessary to know the channels by which this infection is spread. These are chiefly three: droplet infection from the naso-pharynx of the surgeon or the dresser or even the patient; carriage of organisms by the dust of the air; and contact of the wound with infected hands or utensils. These sources are, of course, not mutually exclusive; they link with each other and work through many common agencies. For example, a person carrying hæmolytic streptococci in his naso-pharynx sprays out large numbers whenever he talks. The larger droplets carry bacteria six to ten feet and may infect a wound on which they fall. Many smaller droplets of saliva, however, evaporate and leave the bacteria suspended in the air indefinitely as floating particulate matter. The air-borne bacteria may then contribute to, and be reinforced by, the flora of the wounds of the ward; and so the cycle progresses. Moreover, the primary sources of infection are added to by the contamination of bed-clothing, baths, dressings, plaster casts and instruments. The chief organisms concerned are hæmolytic streptococci and pathogenic staphylococci; less frequently the infection is due to colon bacilli, *Proteus vulgaris or Pseudomonas pyocyanea.*

Prevention of Infection.

In the Operating Theatre.

Precautions regarding asepsis have been fairly strictly observed in operating theatres for about fifty years and have proved fairly satisfactory; but more attention should be paid to masks and to gloves. No practical mask is available which will completely prevent the escape of bacteria from the respiratory tract of a person who is talking. There is no doubt that a thin mask can be worse than useless, if it leaves the nose uncovered, and if it provides the surgeon with such a sense of security that he speaks freely. A masked person who talks expels more bacteria into the air than an unmasked one who remains silent. Similarly, gloves which are expected to protect the wound from infection, will not serve this purpose unless they are used carefully. The number of gloves punctured at operation is surprisingly high. In one large series it amounted to about 20% of the total. Now, the bacteria of the skin multiply rapidly when gloves are worn, and an enormous number may escape in a bead of perspiration which is exuded through a nick in the glove. Post-operative wound infections have been traced to this source.[1]

In the Ward.

The task of preventing cross-infection is much more difficult in the wards; the exposure to infection is greater, the known methods of prevention are more difficult to apply, and the work has to go on all the time in an atmosphere less stimulating than that of the operating theatre. One procedure in the wards should be given special attention, however; that is, the dressing of wounds.[3] There must be at least two nurses. One—the "clean" nurse—looks after the trolly and its contents and supplies the dresser with sterile materials. Throughout the round she should use sterile forceps and touch only them with her hands. She should wash at the beginning and end of the round; her hands must be dry, but they need not be "scrubbed-up" in the usual sense. The second nurse propels the trolly, handles non-sterile material and also does the dressing. She must wash her hands twice during each dressing—once when she has removed the outer bandages and once when the dressing is complete. After the first washing she, too, should use

sterile forceps—one set to remove the old inner dressing and another to apply the new. The time during which the wound is exposed should be made as short as possible. Masks are worn by all those who attend the dressing; unauthorized persons are best kept away and members of the staff with infected hands or throats are sent off duty.

The precautions taken should not be made into a ritual; it is the principles on which they are based that are important, and if these are kept in mind, any changes in procedure required from time to time will not cause either bewilderment or annoyance.

General Precautions against Cross-Infection.

The bacterial count of the air rises to a peak during bed-making and sweeping; therefore wounds should not be dressed within one hour of these two procedures. During the dressings, windows and doors should be closed. Spindle oil may be applied to the floor to lay dust, and a finer grade of white oil may be used on bed-clothes.[4] Soiled articles, such as used bed-linen and dressings, should be put under cover and not left lying about.

Plaster casts in time become infected on the outside. They may be changed if there is no contraindication to this; otherwise they should be wrapped in sterile coverings. Plaster casts should not be removed in the ward.

Conclusion.

The sources of infection in a hospital are so numerous that many people, from surgeon down to junior nurse, are concerned in protecting the patient from cross-infection. A responsibility which is shared so widely tends to be shelved by all. Some English hospitals have therefore appointed one person to the job of teaching and maintaining a proper technique of asepsis throughout the hospital. In the early stages, at any rate, the job is a full-time one.

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MERALGIA PARÆSTHETICA (TENSION NEURITIS OF THE LATERAL FEMORAL CUTANEOUS NERVE).

By C. E. CORLETTE,
Sydney.

Meralgia paræsthetica[1] was described and named as a clinical entity in 1895 by Roth ("Meralgia Paræsthetica", *Meditzinskoe Abozrenie*, Moscow, Volume XLIII, 1895, page 678). Another description of the condition was given in the same year by Bernhardt (*Neurologisches Centralblatt*, 1895, page 242), and it has been referred to in German literature as the Roth-Bernhardt disease. I have not had access to either paper.

The disease is not often referred to, and it is probable that medical practitioners in general know very little about it. That is not because it is uncommon, as some have thought, but because it is in most cases not conspicuously assertive.

Meralgia paræsthetica has on occasion been confounded with other conditions. In such cases, its connotation has been enlarged to include symptoms due to pressure on posterior nerve roots, or to herpes. It has been called a causalgia, because of the burning sensations, but it is something more than that. There is enough evidence to show that it is essentially a neuritis of the lateral femoral cutaneous nerve. The nerve, deriving from the second and third lumbar segments, leaves the lumbar plexus and emerges from the psoas muscle to cross obliquely beneath the iliac fascia and reach, in ordinary cases, the curved edge of the iliac bone immediately below and medial to the anterior superior spine, deep to the inguinal ligament. It curves over this edge of bone to enter the thigh, and at once passes beneath, through or over the sartorius just below its origin. Thereafter it enters a canal in the *fascia lata* where it descends for a few inches to enter at last the subcutaneous tissue of the thigh, where it supplies the skin on its lateral aspect. In some cases the nerve has been found to pass over the crest of the ilium lateral to the anterior superior spine. In one such case, to be mentioned later, the patient had been a sufferer from *meralgia paræsthetica*.

A considerable number of papers on the disease have been published. I have read all those available, but many are beyond reach. An important one was published in 1902 by the late G. E. Rennie, of Sydney, who described three cases, two of them with full neurological detail, but the third was not so complete. We owe to Byron Stookey the most careful and illuminating study of the disease that has yet been written, at all events in English. A paper published in 1921 by H. I. Goldstein purports to describe five cases, of which three occurred in one family. His third patient was a boy, aged eleven years; the fourth, aged eight years, was brother to the third, and the fifth was the father of these two. It has to be said that, as far as the clinical description went, there was nothing in either of the children to justify the diagnosis, and it is not safe to accept the report. A perusal of various papers shows an agreement amongst most authors that the disease is common, but as a rule trivial. But there are others who seem to have noted more often than others a severe type of case, and these men have resorted to operative treatment with relative frequency.

As for the disease being common, let me tell how I came to study it. I have myself had for as many years as I can remember what I know now to be *meralgia paræsthetica*. It has never been particularly troublesome, and only occasionally noticed. Hearing of other sufferers, and becoming curious, I looked into literature and found the condition described as an entity. From time to time I heard of more cases. So far, I know of five medical men, including myself, all consultants in Macquarie Street, Sydney, who are sufferers. In two, it is present on one side only; in the other three it is present on both sides, but in one of them it affected one side for a number of years before it was noticed on the other. Another sufferer from Macquarie Street is the female secretary at a doctor's rooms, who has both sides affected. Another woman was a patient in hospital, and when in bed following cholecystectomy she noticed symptoms on the right side. I had another patient, a man, who discovered loss of sensation in the characteristic area in the right thigh, following an appendicectomy. Another discovered it after an accident when making an inventory of his symptoms for the purpose of claims for damages. This makes nine cases, discovered casually, and it suggests that a search would find many more, and show that the condition is much more common than most of us have suspected. Perhaps some, or many, readers of this study will recognize the condition in themselves. If so, I shall be interested to hear from them. One of Rennie's three patients was a doctor. Of the patients known to me, only one is reported to suffer severely.

Symptoms, Course and Incidence.

The disease makes itself known to the patient first, and chiefly, by sensations of burning, scalding and tingling, confined to the area supplied by the lateral cutaneous nerve of the thigh. It is not necessarily or usually constant. Symptoms are most prominent when walking or standing, and are relieved by sitting or lying down. In some cases the pain is severe, and may be described as

[1] Formed from two compound Greek words meaning "thigh pain" and "deceptive sensation".

intolerable. Permanent anæsthesia is found in cases of long standing—that is, the skin is not sensitive to touch or pricks, though paræsthesia does not depart. That is my own experience. Hyperæsthesia is also described. The hair tends to fall out, and at length the greater part of the area is permanently hairless. Authors describe in some cases a tender spot close to the anterior superior spine. Several writers describe loss of pilomotor reflex, but as far as I know we should not expect pilomotor reflex there in anybody. It is not a site for pilomotor muscles or nerves.

The disease is a chronic one. It seems to last for the duration of life, though pain can be removed by surgical intervention. As it is usually a mild condition, little regard may be paid to it for years, except, perhaps, by the unfortunate type of person who is over-much inclined to take notice of his bodily sensations. Males are said to be affected more often than females. As to the age of patients, one of Rennie's patients was a girl of nineteen, but most come under notice at a later age. However, one can hardly assume that the age at which the disease comes under professional notice marks its beginning. Take, for example, my two hospital patients. One of them made his discovery by finding anæsthesia, which would not be an early symptom. It is in just such cases, and at such times, that a person not usually greatly interested in his sensations would be most likely to make such discoveries, because he has not much else to do, and is almost invited to undertake such observations. Much the same would apply after accidents, as in the case I have mentioned.

Ætiology and Pathology.

Those who have tried to collect lists of alleged causes have recorded many. Few are worth a second thought. However, from various papers one can note suggestions worth attention, or observations that can be pieced together. First of all there is something important to record from Rennie's long-neglected paper. At the conclusion of his paper he makes the following statement:

> The pathological evidence available to throw any light on the condition is very scanty. One case has come to autopsy. It was that of a man 80 years of age, who had been under the observation of Navratsky. A spindle form swelling was found in each external cutaneous nerve at the place where it crosses over the crest of the ilium, and in the region of the swelling there were the changes characteristic of neuritis and perineuritis with secondary degeneration of nerve fibres.

Unfortunately Rennie did not give the location of this reference, and I have been unable to trace it. It should be remarked that the route over the crest of the ilium is not the common one. Here, in Navratsky's case, is concrete evidence, not a speculation. It is a pity that it should have been missed by all writers after 1902.

One suggestion that has been made would attribute the disease to pressure on the upper part of the thigh damaging the nerve. Even the wearing of a truss has been blamed. The first comment on this is that we look in vain for a history to support such a view, except in such a very small number of people that casual coincidence offers a much more reasonable explanation. In the second place, it would be extremely difficult to cause such pressure on a nerve lying in the soft parts, except where it can easily be pressed against a bone. Also, we have other experience of pressure damage to nerves, such as crutch palsy and various sleep palsies, and these come suddenly and tend to get well in time. *Meralgia paræsthetica* does not.

Another suggestion has been that the nerve in its canal within the *fascia lata* is subjected to stresses and strains resulting finally in a chronic neuritis. As we shall see below, Stookey's dissections took the probability out of this. We can also use Navratsky's case as having a bearing. The nerve showed neuritis, but this was at the crossing of the ilium, not at some place lower down and within the *fascia lata*. Moreover, it seems rather improbable that a nerve pursuing a route over the iliac crest would ever enter a canal in the *fascia lata*. The results of certain operations to be discussed further on have also a bearing.

Stookey's paper, already referred to, appeared in 1928. He had a patient with the disease whose pain was intense, and refractory to everyday measures. He decided to cut the nerve as it left the pelvis. At the operation, the nerve was found to be sharply angulated as it passed over a slight bony ridge on the ilium, beneath the origin of the sartorius. Before the operation, the limb had been placed in semiflexion, with a pillow under the knee, and even in that position the nerve was observed to be in constant tension, which was visibly increased when the pillow was removed and the limb extended. The nerve seemed slightly thickened and broader at the point mentioned. Following section of the nerve, retraction of the nerve ends took place. Stookey was struck by this, and it opened his eyes to possible implications. Afterwards he carried out a series of dissections. He found that the nerve was adequately protected from compression by fascia during movement. He was again struck by the abrupt angulation of the nerve as it emerged from the pelvis, especially in particular cases. This angle was considerably increased by extension, and lessened by flexion of the thigh. In one instance the nerve was found to pass over the crest of the ilium (as it did in Navratsky's case of *meralgia paræsthetica*) immediately lateral to the anterior superior spine. Stookey saw an analogy between this neuritis of the lateral femoral cutaneous nerve and the neuritis that sometimes develops in the ulnar nerve when its path has been elongated by a condylar fracture at the elbow. This neuritis, presumably caused by slight frequently repeated tension, may take many years to develop. Most surgeons of experience have seen examples. Stookey further compared it with the neuritis that tends to develop in cases in which the inner trunk of the brachial plexus is carried over a rudimentary cervical rib.

In 1941 appeared a paper by F. C. Lee. In this he mentions a case of particular interest in relation to Stookey's conclusions. Lee stated that he operated on a patient in February, 1936, and found the nerve compressed for a distance of 0·5 centimetre under the inguinal ligament. It was reduced to 40% of its normal size, as measured with callipers. He freed the nerve and gave great temporary relief, but the pain recurred, and in December, 1936, he performed a second operation, at which he cut a slot in the crest of the ilium, severed the inguinal ligament, placed the nerve in the slot, and covered it with two pedicled flaps of fat. This operation removed the angled turn in the nerve, straightening the path. He sutured the inguinal ligament with interrupted silk sutures. The man returned to work three weeks after the operation, and his condition continued to improve gradually. When he was examined two years later, the hair in the area was normal, and there was no sensory disturbance. It will be recognized that this operation, a neurolysis, was in every way analogous to that performed for ulnar neuritis following fractures at the elbow. Lee mentioned that he had previously performed another operation and obtained a successful result by simply freeing the nerve. Lee added his opinion that the cause of the disease is probably a compression of, and tension on, the nerve as it passes under the inguinal ligament. In this connexion it can be said that Navratsky's case, and also Lee's failure to give relief at his first operation, seem to exculpate the inguinal ligament as a compressing agent, and it can also be said that both cases of Lee's exculpate the *fascia lata*, for the patients recovered without the nerve's being delivered from its canal in the fascia.

Reference should be made also to a paper by B. B. King in 1941. He reported five patients operated on by resection of a small segment just beyond the emergence of the nerve under the inguinal ligament. In the fifth case it is recorded that the segment removed, though it looked normal, showed signs of marked degeneration under microscopic examination.

The conclusions formed in this discussion of ætiology favour greatly the probability that Stooke's analogy is correct, and that the disease is a neuritis due to tension. If that is so, it would seem that there is primarily some slight anatomical peculiarity in the individual, which tends in some way to bring about tension on the nerve.

XUM

Treatment.

When a patient suffers from a mild chronic trouble, it is the worst possible treatment to keep it in the foreground of his attention. There is a kind of medical practitioner, not so uncommon, who does this. Psychologically, such men are poisoners, not healers. The best treatment in mild cases is a wholesome neglect, *plus* occupation. However, one should not overdo the neglect. When pain is insistently troublesome, it should be relieved by sitting or lying down, if that is possible. Hot air therapy does not seem to have helped much.

In the more serious cases, nothing will be gained by postponing operation, and operation is the more to be recommended because it is neither very serious nor very difficult; nor is it likely to keep the patient long in hospital. But what type of operation? I have not myself had occasion to perform any of them, and therefore I must judge by reports. We have noted Lee's cases. He obtained success in one by simply freeing the nerve, but in another he had to perform a second operation within a few months, straightening the path of the nerve, and this was completely successful, even to restoration of function. In my judgement, such a method of treatment is unnecessary, over-complicated and far too slow. What troubles the patient is the pain, not the anæsthesia and loss of hair. Section of the nerve just proximal to its emergence from the pelvis should be preferred. This is more radical, but it is prompt. The pain is said to disappear at once. In these cases, the patient already has an anæsthetic patch, and he will not grieve much if section leaves that as it was.

If the surgeon has learnt how, it is easy to perform such operations as this under local anæsthesia, avoiding the discomfort often associated with general anæsthesia. Success can be expected if the following technique is observed. Two hours before the time of operation, give a subcutaneous injection of morphine (one-third of a grain) with hyoscine (one one-hundred-and-fiftieth of a grain) or give the same dose intravenously a quarter of an hour before. Premedication may not be invariably necessary, but it will ensure calmness and absence of fear. The dosage here recommended may not be just what I would employ in major surgery, in which it varies according to the age, but it will do for most people. The strength of the procaine solution (though I prefer to call it by its alternative name, ethocaine) had better be 1% for the deep injection, and though 0·5% would be quite strong enough for the subcutaneous injection, or even for the deep one, there can be no objection to using 1% solution right through in a case such as this. The analgesic drug should be dissolved in 1 in 200,000 adrenaline solution. The line of incision will be vertical, the summit reaching a little above the anterior superior spine. It will vary in length from under three inches in thin subjects to four in the obese. Gloves are not put on till after the injections have been given. With a fine needle make a small wheal in the skin in the line of the proposed incision, and through this pass a larger needle beneath the skin along the line. When the needle is fully inserted, adjust the syringe to it, lock it on, and make the injection slowly while withdrawing, discharging at least two mils per centimetre, or five per inch. The injection must underlie the whole line, and pass well beyond each end. When the subcutaneous line is finished, change the direction of the needle and pass it deepwards till it is felt to perforate the *fascia lata* and then make contact with the bone. The point is now in the same fascial compartment as the nerve, and here from 15 to 20 mils should be injected. An interval of not less than five minutes is now required to give time for the solution to act. During this interval the final preparation of the skin is carried out, the drapery is adjusted, and the surgeon puts on his gloves. The incision should be just medial to the origin of the sartorius. It is carried down to, and then through the *fascia lata*. The nerve should be looked for and cut proximal to the point where it crosses the bone. The surgeon should remember that occasionally the nerve is found to pass over the crest of the ilium just lateral to the anterior superior spine. This may necessitate further infiltration and curved extension of the upper end of the incision, with a little displacement laterally of the superficial parts.

Summary.

Meralgia paræsthetica is a manifestation of chronic neuritis arising from tension on the lateral femoral cutaneous nerve. In certain subjects, some anatomical peculiarity appears to exist which allows the nerve to become subject to tension during standing or walking. The neuritis is located at the place where the nerve curves over the iliac bone to reach the thigh. It is not an uncommon condition, but in most cases the inconvenience is trivial. In exceptional cases there may be severe pain. Such pain can be relieved by section of the nerve just proximal to its exit from the pelvis.

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Reports of Cases.

A.P.C. POWDER POISONING.

By A. M. WATKINS, M.B., B.S. (Melbourne),
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Clinical Record.

D.C., aged forty-five years, a male patient, stated that on three occasions during the past three years he had had severe epigastric pain lasting for an hour, which at once terminated when he voided a large amount of coffee-coloured urine. He had noticed within the last week that he could not walk straight and kept reeling over toward the left side, and he had "felt stupid". People were accusing him of being intoxicated.

The patient looked as if he were completing a prolonged alcoholic debauch. Saliva was drooling from the corners of his mouth, the lower jaw was unslung, the face was of a leaden pallor, the tips of the ears, lips and tongue were deeply cyanosed, and he was mentally retarded. The blood pressure was not increased, his pupils were moderately enlarged, the tendon reflexes were active and no tremor of the hands was present. I got him to pass urine, which was coffee-coloured; it was found to contain urobilin, a slightly more than normal amount of porphyrin, casts, and a few red cells.

Examination of his blood disclosed sulphæmoglobin and intracorpuscular bilirubin and a trace of methæmalbumin. The patient, on being questioned, admitted having taken from 12 to 20 proprietary A.P.C. powders per day for the past four years.

I concluded that the phenacetin in the powder, being turned into *p*-amino phenol, gave rise to the discoloration of the urine and the casts and blood cells it contained, and that the other pigmentary changes in the blood and con-

stitutional signs were due to chronic aspirinism. I believe that continental sources indicate that an excess of porphyrin may give rise to colic, epigastric pain and mental irritation.

Treatment by means of an alkaline diuretic mixture was instituted, and three months afterwards the signs and symptoms had quite disappeared; but the patient was left with a sinus arrhythmia of his heart.

A CASE OF PERFORATED DUODENAL ULCER WITH RECOVERY IN A MAN AGED EIGHTY YEARS.

By G. WINTER ASHTON,
Melbourne.

TANNER[1] states that the latest age on record of recovery from a perforated peptic ulcer was eighty-two years, and the latest but one (his own case) was seventy-nine years. It seems of interest, therefore, to record the following case.

Clinical Record.

J.T.M., aged eighty years and two months, was seized with acute abdominal pain about 5 p.m. He was operated on at 8.30 p.m. with the tentative diagnosis of perforated peptic ulcer. At operation a perforation was found on the anterior surface of the duodenum, half an inch beyond the pylorus. This was oversewn with catgut and a stab drain was placed in the pelvis.

The patient made an uninterrupted recovery, and is alive and well twenty months after the operation.

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Reviews.

AN X-RAY STUDY OF CARDIO-VASCULAR DISEASE.

"CLINICAL ROENTGENOLOGY OF THE CARDIOVASCULAR SYSTEM", by Dr. Hugo Roesler, now appears in a second edition considerably enlarged by the addition of much recent work on this subject.[1] Practically every chapter shows some new feature and further references to the literature are added to the large bibliography at the end of each section. Unfortunately many of the journals listed are not available to the Australian reader, even if he has the polylingual education necessary to study them.

In a work of this kind dealing with a specialized technical method of investigation into such a wide and important branch of clinical medicine as diseases of the cardio-vascular system, the author has to steer a safe course between two reefs. He may become either too clinical to be technically interesting or conversely too technical to be clinically useful, and in either case he wrecks the value and balance of his effort. The true function of such a book is to lead the radiologist and the physician to a common understanding where each appreciates the finer points of the other's work and uses them to improve the worth of his own findings. Actually the book seems primarily written for radiologists, and therefore some technical material is inevitably of little interest to the physician. The balance, however, is on the whole excellently held and sufficient clinical material is included to elucidate the X-ray findings; there is thus no need to consult a text-book on the heart.

This correlation of the clinical with the radiological is a feature which should above all commend the book to the radiologist. The technical perfection of modern radiology has brought it to a point where further substantial progress can be made only by working the X-ray findings right into the texture of the orthodox clinical investigation so that the results from both methods merge into one composite whole from which the differential diagnosis is made. Dr. Roesler, who is obviously master of his subject from both aspects, has gone far towards achieving this ideal fusion of two elements previously considered more or less separately.

Two things impress one on reading this work: one is its efficiency and the second its completeness. This determination to be efficient and complete at all costs is sometimes a little devastating to the morale of the lazy reader who likes his knowledge dilute and sweetened. There are formidable paragraphs in which every line is charged with meaning and filled with facts. Dr. Roesler delights in the short and pithy sentence which means just what it says and no nonsense, but these didactic sentences flow onwards in long, solid paragraphs without space or respite. Reading them is a trifle difficult, for the road is strewn with brickbats of erudition and the closest attention is necessary to avoid a stumble. This difficulty is not really due to defect in composition, for the English as such is excellent, but arises from the rather astonishing mass of real learning presented with a stern determination to leave nothing out.

For example, over three hundred illustrations appear and the legend under each includes almost a complete clinical history of the patient, but the close attention necessary to read these is more than repaid by the real knowledge gained. There are simpler books on this subject, more agreeable to read, but none so comprehensive. The way of knowledge is hard and Dr. Roesler is no sugar dispenser. He presents the reader with all the knowledge he has—and it is considerable—without rhetoric or adornment, but systematized, concise and dogmatic.

This book is an achievement in the study of cardio-vascular disease. It takes industry, application and close attention to read it, but above all, it needs to be kept close handy for repeated study and reference by cardiologist and radiologist alike. It will be an ever-present help in times of diagnostic trouble.

[1] "Clinical Roentgenology of the Cardiovascular System", by Hugo Roesler, M.D., F.A.C.P.; Second Edition; 1943. Springfield: Charles C. Thomas; London: Baillière, Tindall and Cox. 10" × 6¼", pp. 497, with 337 figures. Price: $7.50.

DISEASES OF INFANCY AND CHILDHOOD.

THE fourth edition of Wilfrid Sheldon's "Diseases of Infancy and Childhood" will be just as popular as the earlier editions, which have already established themselves as standard text-books for final year medical students and practitioners.[1] Although the general arrangement and much of the text are unaltered, the study of pædiatrics has advanced a good deal in three years, in spite of the war, and this has called for many revisions and additions. For example, more space has been devoted to the sulphonamide drugs; although in this regard not everyone will agree with the author's conservatism in withholding sulphapyridine in cases of ordinary lobar pneumonia.

Into the space of fifty pages the author compresses a good account of the common acute infectious diseases. Dealing with scarlet fever, he is courageous enough to set out in writing what many of us believe, but which is not officially admitted, namely, that hæmolytic streptococcal tonsillitis and scarlet fever are essentially identical conditions, and that the patient with hæmolytic streptococcal tonsillitis (but without a rash) is just as infectious as the one with a rash, and should be just as carefully isolated.

There is very little to criticize. Mention might have been made of the new *Hæmophilus influenzæ* antiserum, which has reduced the mortality in influenzal meningitis by about half. The clumsy wooden splint for fixation of the head in cases of tuberculous glands of the neck, depicted on page 463, is not nearly so efficient as the moulded wire frame splints. It is also surprising to see the author recommending that vitamin *K* should be taken by mouth for the treatment of hæmorrhagic disease of the newborn, when intramuscular injection has a much more rapid effect.

However, these small criticisms in no way detract from the general excellence of Sheldon's book. Special features are: the sections which deal, not with direct descriptions of particular diseases, but with single symptoms as they are likely to present themselves, for example, diarrhœa; the first few pages on the examination of children; the detailed prescriptions interspersed in the text; the excellent illustrations; and the appendix containing the exact vitamin content (in international units) of a very large number of commercial vitamin preparations.

As a whole the book gives a very complete and useful account of children's diseases and can be confidently recommended.

[1] "Diseases of Infancy and Childhood", by Wilfrid Sheldon, M.D. (London), F.R.C.P. (London), with a foreword by the late Sir Frederic Still, K.C.V.O., M.A., M.D., LL.D., F.R.C.P. Fourth Edition: 1943. London: J. and A. Churchill Limited. 9" × 5¼", pp. 758, with many illustrations. Price: 28s.

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INFECTIVE HEPATITIS.

INFECTIVE conditions of the liver characterized by jaundice occur from time to time in sporadic and in epidemic form. Epidemics, naturally enough perhaps, attract unusual attention in wartime, and it is recorded that an epidemic illness accompanied by jaundice occurred during the Franco-Prussian War, the American Civil War and the Boer War. During 1940 and 1941 hepatitis appeared in epidemic form among troops in Palestine, and at the suggestion of the Deputy Director of Medical Services, British Forces in Palestine, and of the Consultant Physician of the Middle East Force, J. D. S. Cameron carried out an investigation.[1] Incidentally, we may note that the attitude of the British Army authorities to research must have changed since the times during the war of 1914-1918, when research was frowned upon and science was anathema to "leading members" of the Royal Army Medical Corps,[2] for Cameron was "provided with full facilities and abundant co-operation, both military and civil". The study of infective or epidemic hepatitis is as fascinating as it is important, and its importance is shown by the gravity of the illness and by the gaps in our knowledge concerning it. Catarrhal jaundice, we are told by E. A. Cockayne, whose paper[3] is still worthy of careful attention, was well known to Greek and Roman writers; but the first undoubted reference to its epidemic form is by Cleghorn, who wrote of its prevalence in Minorca in 1745. Cockayne held that catarrhal jaundice was nearly always the sporadic or endemic form of epidemic catarrhal jaundice. He also distinguished between epidemic catarrhal jaundice on the one hand and infectious jaundice or Weil's disease on the other. Sporadic jaundice, epidemic catarrhal jaundice and acute yellow atrophy of the liver were, he maintained, due in the great majority of cases to the same cause, "a specific organism of unknown nature". Cameron at the outset states that there can be little doubt that a modification must be made in the original concept of catarrhal jaundice advanced by Bamberger in 1855 and supported by Virchow ten years later, a concept which has been held by most physicians until recent years. The idea was that the initial lesion was a gastro-duodenitis which was followed by spread of catarrh to the epithelium of the bile ducts, an obstructive jaundice being thereby produced. This view carried with it a benign prognosis, and in Cameron's opinion this has delayed the elucidation of the true pathology. Cameron goes on to remark that the occurrence of a biphasic Van den Bergh reaction raised doubts about the simple explanation and suggested that liver damage must be combined with biliary obstruction, if indeed the latter was present at all. "Many physicians have claimed that two conditions exist—true catarrhal jaundice with the obstructive element predominating and little, if any, hepatic involvement, and infective hepatitis in which liver damage is of major and biliary obstruction of minor importance." A. F. Hurst and C. K. Simpson are among these, and Hugh Barber, in referring to their views,[1] states that on theoretical grounds the Van den Bergh test should be of use in the differentiation, a direct positive result being obtained in "catarrhal jaundice giving rise to obstructive jaundice", and a biphasic reaction being obtained in toxic hepatitis. At the same time he admits that the readings are not sufficiently convincing and are probably of less value than the presence or absence of bile in the stools. Barber thinks that most cases labelled catarrhal jaundice are really due to an acute hepatitis and should be called infective hepatic jaundice. Cameron explains that the cases discussed by him are those of "hepatitis in which liver damage is of major and biliary obstruction of minor importance". He uses the term infective hepatitis in preference to catarrhal jaundice and he thinks that in some instances hepatitis is present without the occurrence of jaundice.

Though there is no need to describe in detail the cases with which Cameron deals, one or two features should be mentioned. The total number of cases in Cameron's series was 489; of these 250 were studied and the clinical picture is based on the records of 170 of these. Four stages are described: (*a*) initial fever, (*b*) an intermediate period, (*c*) a hepatotoxic stage with fever, (*d*) jaundice. The opinion is held in Palestine that the disease may occur without jaundice, but Cameron refers only to cases in his own series, in all of which jaundice was present. Enlargement of the liver was noted in 97 of the 170 patients, and the enlargement was transient, lasting in most cases seven to fourteen days. Study of the incidence among members of the hospital staffs showed that all but one of those affected had had direct and close contact with a source of infection and that spread occurred from one hospital to another. That a nursing sister and two orderlies became affected while they were engaged in caring for patients with hepatitis, is regarded as significant in showing the contagiousness of the disease and the need for the isolation of patients. Although Cameron is not prepared to make a positive statement about it, he inclines strongly to the view that infection may spread during

[1] *The Quarterly Journal of Medicine*, July, 1943.
[2] A. G. Butler: "The Australian Army Medical Services in the War of 1914-1918", 1943, page 231.
[3] E. A. Cockayne: "Catarrhal Jaundice, Sporadic and Epidemic, and its Relation to Acute Yellow Atrophy of the Liver", *The Quarterly Journal of Medicine*, Volume VI, 1912-1913, page 1.

[1] Hugh Barber: "Infective Hepatic Jaundice", *British Medical Journal*, January 9, 1937, page 67.

part of the incubation period, during the preicteric stage and during portion at least of the icteric period. Cameron carried out some experimental investigations in association with I. J. Kligler and D. G. Colville. An attempt was made to transmit the disease to animals, but without result. Observations were also made on six human volunteers who received inoculations. Of the six, one developed jaundice one month after injection, a second within two months and the remaining four within six months. The conditions in which these volunteers were placed after inoculations, were such that the experiments were "by no means complete and free from possible error", but it seemed probable that they suffered from jaundice as a result of their inoculations, and that in five of the six cases the onset was delayed until the hard conditions of field service made the subjects susceptible to the disease. Attempts to transmit the disease by insect vector to human volunteers were unsuccessful. A study of the pathology in association with J. L. Dales (the material being obtained from sources outside Cameron's series) yielded conclusions similar to those of other workers—that a generalized infection damaged the blood vessels and that this led to hæmorrhages and especially to liver damage resulting in necrosis.

Cameron's article should be studied in association with another on the pathology of acute hepatitis by J. H. Dible, John McMichael and S. P. V. Sherlock.[1] These authors, it should be remarked, refer to the magnitude of the problem of jaundice in wartime, and state that for this reason they have tried to amplify and extend the studies started in Denmark by Iversen and Roholm and published in 1939. The method used has been aspiration by a cannula passed through the pleura into the right lobe of the liver. Although they have used this method, Dible and his co-authors emphasize its risks and deprecate its use as a routine procedure. They point out that the changes in the liver are related to the severity and duration of the disease. The picture is described as being one of hepatic cell necrosis and autolysis, associated with leucocytic and histiocytic reaction and infiltration. "The centres of the lobules show the first of these changes most markedly, and the portal tracts the greatest cellular infiltration. In certain cases, which seem to be either those which are mild from the beginning or in which the lesion is retrogressing, the periportal cell accumulations predominate in the picture . . . in contradistinction to the more severe cases in which hepatic cell degeneration is more pronounced and the histiocytic and leucocytic infiltration more widespread." There are no good reasons for regarding these differences as fundamental, and an intermediate picture sometimes occurs. There are also cases in which the lesion is well on in the phase of retrogression or is progressing to a stage of necrosis, nodular hyperplasia or cirrhosis. Dible and his co-authors state that their material is in accordance with the mass of evidence pointing to hepatitis as the pathological basis of epidemic jaundice. The old view of Virchow that the jaundice was due to obstruction need, they believe, "no longer be considered". They add that Van Rooyen and Gordon in intubation studies found no evidence of duodeno-biliary catarrh. If any obstructive factor exists, it is, they hold, intralobular and not interlobular. They point out that the frequency with which a periportal "cirrhosis-like" picture is encountered leaves little doubt that it constitutes one pathological form of acute hepatitis. Their studies also emphasize the view that acute and subacute necrosis may follow epidemic hepatitis, a view to which reference has already been made.

The investigations mentioned show the lines along which this important condition is being investigated. It is necessary to keep an open mind and not to regard the conclusions reached as final. The cases investigated by Cameron were more or less of a special type, and he states that his figures are not in full accord with those of other workers in Palestine. This statement does not detract from the value of his work, which, it must be remembered, was apparently carried on while normal army routine was in progress. Neither is it derogatory to regret that he was unable to isolate and keep under observation the volunteers on whom he made his experiments. Turning to the work of Dible and his co-authors, we must remember that the method by which the material was obtained may not have been wholly satisfactory—the authors indeed raise the question whether the lesions studied by them are representative of the liver as a whole. They also point out that the material has been taken from hospital patients and that their diseased state may be more severe than that of patients treated at home. The infective agent has to be determined. It must also be decided whether this agent can cause a "catarrh", and if so, whether the "catarrh" is capable in some instances of causing obstruction that can share in the pathogenesis. That the condition can and often does develop without obstruction is abundantly clear. Further work on this subject will be awaited with more than usual interest.

[1] *The Lancet*, October 2, 1943.

Current Comment.

PATHOLOGICAL FINDINGS AFTER DEATH FROM ACCIDENT.

THE young graduate newly appointed to a resident post in a hospital is certain to find himself before very long on duty in the casualty department where he will have to see patients who have been injured in accidents of many different kinds and of varying degrees of severity. Sometimes he will find that the patients have succumbed to their injuries before they reached the hospital and sometimes death will occur soon afterwards. While in these circumstances it will be obvious that death may be attributed to the accident, it will not always be possible to determine the nature and situation of the lesion responsible. Very often the most obvious lesion is blamed, and though this may satisfy the coroner, post-mortem examination will show that mistakes are by no means uncommon. Just as the discovery of an unexpected lesion at autopsy may add to knowledge, so the complacent acceptance of the obvious as the cause of death and neglect of autopsy are likely in the long run to give rise to the idea that accuracy does not matter. In a recent study of the findings in 262 fatal accidents[1] C. R. Osborn declares that diagnostic errors are commoner in the everyday accident case than in any other. He states that lesions of the lung caused by blast in air raids are now commonly recognized, and that similar lesions of everyday accidents, though just as common, are usually overlooked. The symptoms caused by these lesions are ascribed to a head injury, which is not necessarily present, if the patient is brought to the hospital unconscious, and to shock if he is conscious.

[1] *The Lancet*, September 4, 1943.

Osborn's findings, which are very instructive, are taken from an unselected and consecutive series of fatal accidents occurring in the Derby and Burton-on-Trent districts, England. They are summarized in a comprehensive table. Some of the main features should be noted. Of the 262 fatal accidents, 78 were unaccompanied by injury to the brain or body viscera. In nine cases death was directly due to accident; in 23 cases death was due to sepsis; in nine cases it was due to acute pulmonary œdema, in nine to systemic disease, in nine to pneumonia; other causes accounted for 19 deaths. Fifty accidents were associated with injury to body viscera, but not to the brain. In 42 of these death was due directly to the accident, and other causes included pneumonia, sepsis, gas gangrene and pulmonary embolism. The number of organs injured in each instance varied between one and six. The lungs were injured most often (33 cases), and next in order came liver (22 cases), spleen (17), heart (11), large bowel (8), small bowel (6), kidney (4), bladder (2), pancreas (1). Forty-seven accidents resulted in injury to both body viscus and brain. In 27 cases the head injury caused the death, in 13 the body viscus injury was responsible, and in seven the responsibility was shared equally by both types of lesion. The organs most often injured were the lungs (45 cases), liver (13) and spleen (10). In six cases the head injury was trivial (Grade I); in eight it was more severe, but no large or certainly lethal injury was present (Grade II); in eleven the damage was extensive, but no certainly lethal injury was present (Grade III); in 22 cases the damage was so severe that recovery could not be expected to occur (Grade IV). In 87 of the 262 accidents injury to the brain was present, but the body viscera were not damaged. Fourteen of the head injuries fell into Grade I, 31 were in Grade II, 29 in Grade III and 13 in Grade IV. Death was due to the head injury directly in 42 cases; the next two most frequent causes of death were pneumonia (14 cases) and sepsis (12 cases).

Lesions due to direct violence and *contre coup*, commonly recognized in the brain, have their counterpart in the heart and lungs in injury due to accident, and in addition a third type, due to "pincer" forces in V-spaces, is also found. Osborn states that the contre-coup lesion is typically much larger than the lesion caused by direct violence and is often obvious when the latter is slight or absent. He shows that contre-coup lesions of the lung may be seen in all stages of development. The simplest lesion is a hæmorrhagic straight line on the lung in an almost constant position which corresponds with the angle of the ribs posteriorly. Often a row of blisters is seen in addition to the subpleural blood mark. The hæmorrhagic line is produced by varying combinations of subpleural hæmorrhage and hæmorrhagic concussion of the underlying alveoli. When the lesion is more severe it is commonly found to extend upwards to the *cupola pleuræ*. This is an end space, superiorly, similar to the space, posteriorly, in the region of the angle of the ribs. In a further stage of development considerable lateral and anterior extensions occur from the hæmorrhagic straight line of the earliest stage. The lateral extension may become confluent with phrenico-costal contusions, which will be mentioned later. Osborn points out that the posterior contusion may be so extensive that by its size alone it may produce symptoms and endanger life. He depicts in a diagram two contusions found in an officer who died of acute pulmonary œdema four hours after a crash; he was thought to be suffering from severe concussion, but the only head injury affected the cartilaginous septum of the nose. In discussing lung lesions from pincer forces, Osborn states that V-shaped spaces are weak spots in the thorax since pincer forces can be applied to the sides. As the simplest example of these lesions, he refers to the phrenico-costal contusion. Readers will find a description of this lesion from Osborn's pen in the *British Medical Journal* of September 7, 1940, at page 317. He describes pneumonia occurring in an area of lung that has been "caught in a pincers movement". Though other aspects of lung lesions might be discussed, it may be concluded generally that when force is applied to the ribs the direct violence may produce on the underlying lung what are known as rib markings. If the lung underlying the point of contact absorbs the force of the indriven ribs the further lung may escape damage; if the alveoli on the other hand transmit the force, the lung underlying the point of contact may show less damage than its fellow.

Osborn describes non-penetrating traumatic lesions of the heart and shows that in addition to contusions from direct violence, lesions from *contre coup* and pincer lesions, there also occur lesions due to the heart's contractions. That these should occur will be readily understandable when it is remembered that the heart is a muscular organ contracting with considerable force. "Definite pulls may be in existence at the time of injury, and it would be surprising if these did not play a part in producing the lesions seen afterwards."

A great deal of space has been devoted to Osborn's discussion on lesions of the lung and heart, and the aspects mentioned are probably the most important in his contribution. Some diagnostic and clinical points, however, should be mentioned. In general it may be stated that the greater the force, the higher is the probability that lesions of the body viscera exist. Further, the symptoms commonly described for lungs injured by "blast" may be found in the pulmonary contusion of ordinary accidents. The most important error in diagnosis has to do with head injury. In the series of 262 patients, 137 were regarded as suffering from head injury; nine had no demonstrable head injury and another five had a head injury so trivial that it was not likely to be responsible for the patient's condition. This means that one patient in ten did not have the head injury for which he was being treated. Another diagnostic pitfall is "pseudo-pulmonary embolism". In this series six patients were diagnosed as suffering from pulmonary embolism; no embolism was found, but death was due to undiagnosed gas gangrene. Of the therapeutic pitfalls listed by Osborn two will be mentioned—pulmonary embolism and acute pulmonary œdema. The former he discusses in relation to its prevention by active and passive movement; in connexion with the latter he refers to the giving of blood transfusions.

The whole subject discussed by Osborn resolves itself into a question of who shall see and treat patients brought to hospital after accidents. He advocates the establishment of "combined clinics" of specialists as described by Whipple. Though this desirable arrangement may not be possible, it is quite certain that the casualty surgeon should not be left to his own devices in the casualty department.

THE BIRTH OF QUINTUPLETS IN THE YEAR 1566.

MEDICAL HISTORIANS will be interested in the reproduction of a woodcut of the year 1566 depicting the birth of quintuplets. The illustration which had previously been published in *Annals of Medical History* of 1942 is now published by W. B. McDaniel, Librarian of the College of Physicians of Philadelphia, in the *Transactions and Studies* of that college for February, 1943. In the upper half of the "broadside" the patient is shown in bed propped up by pillows with the midwife in attendance; near by is a table on which the five infants lie; four are swathed in linen wrappings and the midwife is apparently wrapping the fifth in its coverings. Below is what McDaniel calls a "florid, tautological German text" of which he gives a translation. The document is stated to be a "true description of a recent wonder-birth". The birth of the five children, all of whom died, is described. McDaniel draws attention to the concept of the wonder-birth as "a divine manifestation of enigmatic import" and also to "the cautious hope that such miracles will lead men to a just recognition of the divine prowess". "Not unusually, and not unnaturally", he writes, "wonder-births were regarded . . . as punishment for sins of adultery or bestiality." This is thought to explain why such care was usually taken to establish for the woman "an impeccable marital status".

XUM

Abstracts from Medical Literature.

BACTERIOLOGY AND IMMUNOLOGY.

Fixation of Foreign Material in Inflamed Tissue.

A. A. MILES AND E. M. MILES (*The British Journal of Experimental Pathology*, June, 1943) have investigated the fixation of foreign material in inflamed tissue, with special reference to the action of *Clostridium welchii* toxin and antitoxin. They used rabbits for their experiments. *Clostridium welchii* toxin was injected into the *adductor magnus* muscle, to produce inflammation; some hours afterwards the material to be fixed (dye or antitoxin) was introduced into the circulation or tissues. The authors found that exudate derived from the circulation accumulates in the intercellular spaces of muscle or skin inflamed by *Clostridium welchii* toxin, and is retained there chiefly because of the quantitative inadequacy of existing lymphatic drainage. If in the early stages of the inflammation the circulation contains antitoxin, the accumulating exudate is relatively rich in antitoxin. Antitoxin introduced later passes only slowly into the lesion, owing to the exudate that has already accumulated. This accounts, at least partly, for the relative inefficacy of antitoxin administered in the later stages of a local progressive *Clostridium welchii* infection. In the course of artificial intoxication with this organism, there is no evidence that the accumulation of antitoxin is necessarily a "fixation" or a "concentration" of foreign protein; neither pontamine blue nor proteolytically refined horse antitoxic globulin appeared in the lesions in concentrations greater than could be explained by the simple exudation of the blood plasma into which they were originally introduced; nor is there evidence that the retention of antitoxin is due to lymphatic blockage or to the formation of a fibrinous network around the lesion. The accumulation and retention of exudate, and the damming back of further exudate in spite of persisting permeability of the capillary endothelium, are sufficient to explain "fixation" and its consequences, as revealed by the techniques employed up to the present. The authors do not claim, however, that the explanation is complete. Further, though the simple hypothesis may be applicable to the "fixation" of a wide range of foreign materials in many types of inflammatory lesion, no ready generalization is possible. The result in each case will depend upon the chemical and physical properties of the different foreign substances and of the different inflammatory lesions.

Sulphonamide-Resistant Pneumococci.

M. HAMBURGER, JUNIOR, L. H. SCHMIDT, CLARA L. SESSLER, J. M. RUEGSEGGER AND EDA S. GRUPEN (*The Journal of Infectious Diseases*, July-August, 1943) have studied the occurrence of sulphonamide-resistant pneumococci in clinical practice. The purposes of the study were: (i) to determine whether sulphonamide-resistant pneumococci are present in the sputum or blood before treatment of patients with pneumococcal infections, and whether therapeutic response can be correlated with the sulphonamide sensitivity of the organisms isolated before treatment; (ii) to determine the conditions under which pneumococci acquire resistance to sulphonamides when these drugs are used in the treatment of the infected patient. The clinical material consisted of 172 patients, of whom 163 were suffering from pneumonia, seven from meningitis, five from endocarditis and one from subacute bacterial endocarditis due to *Streptococcus viridans* associated with type VIII pneumococci in the sputum. Some of the patients were affected by more than one of the conditions. Pneumococci were isolated from 168 patients before sulphonamide treatment; in none of these cases were highly resistant pneumococci found, and in only six instances were moderately resistant organisms encountered. The organisms from the remaining 162 patients were sensitive to sulphonamides. The authors have come to the following conclusions. Pneumococci highly resistant to the sulphonamides occur rarely, if at all, in untreated patients. Even moderately resistant organisms occur only infrequently, and their presence does not necessarily retard recovery, unless other complicating factors are present. Pneumococci may acquire resistance to sulphonamides during the administration of one of these drugs to the patient. Moreover, pneumococci which become resistant to one sulphonamide are also resistant to other commonly used sulphonamides. When contact between pneumococci and a sulphonamide is not uniform, as in valvular vegetations and slowly resolving pulmonary lesions, some of the organisms present become resistant to sulphonamides, whilst others remain sensitive to them. Homologous pneumococci may persist in the respiratory tracts of patients for long periods after recovery from pneumonia, in the treatment of which sulphonamides have been used. Such pneumococci may be just as sensitive to sulphonamides as those isolated from the same patient before treatment. The authors consider that, although the development of sulphonamide-resistant pneumococci is not a serious public health problem at the present time, it may constitute a greater hazard in the future. The chief reasons for this opinion are that recovery from a pneumococcal infection may take place despite the presence of organisms moderately resistant to sulphonamides, and that a "carrier" state may follow clinical cure and persist for weeks, months or years.

Helvolic Acid: A New Antibiotic.

E. CHAIN, H. W. FLOREY, M. A. JENNINGS AND T. I. WILLIAMS (*The British Journal of Experimentall Pathology*, June, 1943) describe the isolation from the fungus *Aspergillus fumigatus*, mut. *helvola* Yuill of an antibacterial substance, which they have named helvolic acid. Helvolic acid titrates as a monobasic acid, and from it a crystalline monomethylester has been prepared by the action of diazomethane. Helvolic acid is soluble in most organic solvents except petrol, but it is insoluble in water; its sodium salt is readily soluble in water. The antibacterial activity of the substance is not affected by heating to 100° C. for fifteen minutes in 2N acid or at pH 7 or pH 10. In general helvolic acid is active against Gram-positive organisms and almost inactive against Gram-negative organisms. The dilution at which it inhibits growth is influenced by the number of organisms in the inoculum. Its action is predominantly bacteriostatic. Experiments *in vitro* with sensitive strains of streptococci and staphylococci showed that resistance was developing, and the concentration of helvolate was repeatedly increased. After twenty-six days of passage, both the organisms required a concentration of helvolate 250 times greater than the original strains required for the complete inhibition of growth. Sensitivity to penicillin had not decreased. The largest intravenous dose of sodium helvolate tolerated by mice weighing 20 grammes is about five milligrammes; 20 milligrammes are tolerated if given by the gastric route (larger doses were not tried). Leucocytes are unaffected by dilutions over 1:1,600, and tissue cultures can be exposed to a dilution of 1:2,500 for forty-eight hours without the production of irreversible changes. The substance is absorbed from the subcutaneous tissue and gastro-intestinal tract; it is excreted in the urine and bile. A high antibacterial titre can be produced in the blood; but repeated injections damage the liver. Mouse-protection experiments have shown that the substance prolongs life.

HYGIENE.

The Range of Dispersion of Anopheles Quadrimaculatus.

D. E. EYLES AND L. K. BISHOP (*American Journal of Hygiene*, May, 1943) have studied the range of dispersion of *Anopheles quadrimaculatus*. Mosquitoes were collected in barns dusted with a fine bronzing powder; about 16,000 were thus marked. The country is described as bottomland forest on the border of a lake. From the point of release 31 *Anopheles quadrimaculatus* females were caught 2·0 to 2·5 miles away, and one male was caught at 2·0 miles. The greatest number captured were 2·0 miles away seven days after their release. No strong wind occurred during the test.

Reservoirs of St. Louis and Western Equine Encephalitic Viruses.

W. M. HAMMON, W. C. REEVES AND M. GRAY (*American Journal of Public Health*, March, 1943) from the Hooper Foundation report on the mode of spread and methods of control of encephalitis. Their findings are based on the study of the St. Louis epidemic of 1933 and the North Dakota (western equine) epidemic of 1941. In the Yakima Valley area, Washington, the viruses of both forms of encephalitis have now been repeatedly isolated from the mosquito, *Culex tarsalis* Coq. Antibodies were found in as many as half the healthy domestic fowls in the epidemic and other areas. Controls and laboratory-bred fowls were free. Arthropod transmission was also effected through *Culex pipiens* Linn.

and with *Dermacentor variabilis* (Say). The dog tick has not been involved in these epidemics. In the transmission of the equine viruses, *Aëdes* mosquitoes, the wood tick and the cone-nosed bug were implicated. Neither virus has been isolated from nose and throat washings, or from the urine or fæces of man or horse in naturally acquired infections. These virus diseases may be classed as arthropod-borne virus encephalitides. This excludes rabies, African trypanosomiasis *et cetera*. Both types of virus studied are mosquito-borne from a huge inapparent vertebrate reservoir, particularly the domestic fowl. Other mosquitoes of the *Culex*, *Theobaldia* and *Aëdes* genera can transmit the viruses in the laboratory and may possibly be vectors. Mosquito control and protection from mosquito bite are indicated, and in special instances (for example, in western equine infections) human vaccination.

Epidemic Diarrhœa of the Newborn.

P. A. LEMBCKE, J. J. QUINLIVAN AND N. G. ORCHARD (*American Journal of Public Health*, October, 1943) report on an investigation of a number of cases of diarrhœa which occurred among infants in a hospital; some were fatal. The outbreak lasted five weeks. Of 144 children who were partly breast fed, 22% became ill, and of 33 completely artificially fed children, 55% were affected. Of the breast-fed infants 11% and of the artificially fed infants 36% were seriously affected. The incubation period was about five days, but was as short as one day or as long as ten days. None of the known bacillary organisms could be found in the stools; but injections into mice showed the presence of an unidentified lethal agent. Technique was tightened up for the thorough sterilization of rubber nipples and of milk mixtures. Diapers were changed after and not before the children were fed, and hands were carefully washed. A second outbreak without fatality affected breast-fed and artificially fed children alike, and was thought to be due to carelessness with a bowl of cotton pledgets for cleaning the nipples. These could be contaminated by the fingers of the nurse. Individual pledgets handled by forceps were used with success. Training of personnel and proper equipment are important. Prompt investigation by a health officer (epidemiologist) is recommended.

Epidemiology of Epidemic Keratoconjunctivitis.

J. E. PERKINS, R. F. KORNS AND R. S. WESTPHAL (*American Journal of Public Health*, October, 1943) discuss an outbreak of several hundred cases of epidemic keratoconjunctivitis in one industrial plant in Schenectady, New York City. From late August to January cases occurred, the peak being at the end of September. In 86% of cases of the main group corneal opacities developed, chiefly in the second and third weeks after onset. Over 4% of people were affected both at the works and in the workmen's households. Sex did not count. Unusual features were the high attack rate among dispensary physicians and nurses. The eye clinic, though not the principal means of spread, may have favoured dissemination, and a more stringent separation of patients and more care in technique did reduce the proportion of cases among those attending the eye clinic. Persons wearing goggles and liable to injury were most often affected. Foreign bodies in the eye and night work appeared to be predisposing factors. Carriers were found. The infection is caused by a virus. The spread is respiratory and most people seem immune.

Poliomyelitis in Cuyahoga County, Ohio, in 1941.

M. KRAMER, J. A. TOOMEY, H. J. KNAPP AND J. A. DOULL (*American Journal of Public Health*, October, 1943) present from Western Reserve University a study of an epidemic of 189 cases of poliomyelitis in Cleveland and the surrounding country. Of the patients, 95% were sent to hospital, and while only 17·5% of infections were of the abortive type, 31% were of the bulbar type. The percentage incidence compared with the 1930 epidemic was six times as great among subjects aged over fifteen years and only one-third as great among those aged under five years; but in all 77% of cases occurred in children aged under fifteen years. Males were 61% of the patients and were attacked at an earlier age. The 189 cases occurred in 180 families, and only in three families did any cases appear five to twenty days after the previous case. Of 438 contacts, five contracted the disease after the appropriate interval. The evidence did not support distribution of the infection by water, by milk, by raw fruit, by vegetables or by swimming. Subjects living in areas of more expensive rentals were attacked by the disease somewhat more frequently than those living in other areas. If excreta were a major factor, either directly or through flies, the reverse would be expected. No directly pertinent epidemiological data incriminated flies as vectors. The attack rate was 155 per million. The fatality rate was heaviest in males aged ten years and over, nearly three times that among females. Of the 137 survivors examined, 3·7% were bedridden, 7·3% were severely affected, 27·7% were moderately severely affected, 56% were only slightly affected and 5·1% were normal.

The Ætiology of Malignant Diphtheria.

M. FROBISHER (*American Journal of Public Health*, October, 1943), in a review of the use or misuse of the terms *gravis* and *mitis* strains in diphtheria, points out that many *gravis* strains have been shown to be wholly avirulent, while outbreaks have been seen in which severe cases were due to the *mitis* type, and persons with mild infections and healthy carriers may harbour *gravis* types. In 237 cultures different workers found 4% to 43% *gravis*; five workers found 6% and two found 9% of organisms to be of the *gravis* type. The *gravis* type must be defined as a cultural variety without regard to clinical or epidemiological significance, and not a *sine qua non* of malignant diphtheria. Either *Corynebacterium diphtheriæ* has other properties not tested by current methods, or a third factor, *X*, is responsible. In view of the confusion, the term *gravis* for malignant diphtheria should be given up, and cultural types should be denoted by Roman numerals: *mitis* type, O; *gravis* type, VII; intermediate type, I to VI. Associated streptococci have been blamed for infections refractory to antitoxin owing to their synergistic action. A case of *mitis* diphtheria associated with Lancefield group A streptococci is quoted, in which enormous doses of antitoxin failed and sulphathiazole succeeded. A dual virus and bacterial causation is possible. Diphtheria organisms may fluctuate in virulence. Other toxins than the usual exotoxin of *Corynebacterium diphtheriæ* may be produced. Small amounts of iron may modify toxin production. The resistance of the host may vary owing to diet deficiency, extreme fatigue *et cetera*.

An Outbreak of Food-Borne Streptococcus Infection.

V. A. GETTING, F. M. WHEELER AND G. E. FOLEY (*American Journal of Public Health*, October, 1943) report on the outbreak of infection due to a food-borne streptococcus. A rural church reunion in July, 1941, was quickly followed by illness in 102 out of 142 people who attended it; 24 of these developed scarlet fever and 56 developed sore throat. One of the hams was cooked and sandwiches were made by a woman who herself was in the early preeruptive stage of scarlet fever. The ham sandwiches were eaten twenty-four hours later. Gastro-intestinal symptoms were severe. Hæmolytic streptococci Lancefield group A, Griffith type II, were recovered from the ham, from the throat of the food handler and from the throats of nine patients.

Dust Reduction at the Coalface.

C. G. WARNER (*The Journal of Industrial Hygiene and Toxicology*, September, 1943) has carried out experiments on dust reduction in south Wales coal mines. Water can bring about this reduction (*a*) by suppressing dust already in the air, (*b*) by laying dust already formed and (*c*) by preventing the formation of dust. The author found that the concentration of air-borne dust at the coalface could be reduced by one-half if all hewn material was sprayed with water before it was further handled. Water was stored in casks near the coalface, and buckets were filled from these. The spraying was done by means of the stirrup pump used by fire-fighting personnel in Great Britain, the fine spray nozzle being used. The quantity of water used was insufficient to make any sensible difference to the humidity of the air. Since care was taken not to spray the roof, and since the atmospheric humidity was virtually unaltered, the use of water could have had no adverse effect on the weathering of the roof. Further, since only a small amount of spraying was necessary, little extra work was imposed on the men, and the procedure could reasonably be carried out by them as a routine measure. The author considers that a more copious use of water would have produced a greater reduction in the dust; but it was thought desirable during the experiments to restrict the consumption of water to an amount that would neither inconvenience the management or the men, nor adversely affect the roof.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on September 30, 1943, at the Robert H. Todd Assembly Hall, British Medical Association House, 135, Macquarie Street, Sydney, Dr. K. S. M. BROWN, the President, in the chair.

Hospital Infection of Wounds.

DR. V. J. KINSELLA read a paper entitled "The Prevention of Hospital Infection of Wounds" (see page 121).

DR. R. L. STEPHENS read a paper entitled "Hospital Infection of Wounds" (see page 124).

A paper by Dr. Colin White entitled "The Prevention of Hospital Infection of Wounds" (see page 126) was read in his absence by Professor H. K. Ward.

DR. C. C. MCKELLAR said that he had been studying the subject for some time and wished to discuss it under five different headings; they were: (i) general, (ii) air sterilization, (iii) sterilization of materials, (iv) questions to pathologists, (v) specific resolutions. With regard to the first heading, Dr. McKellar said that it was disappointing that a subject such as the one under discussion, wherein the results obtained in the treatment of large numbers of open wounds were valuable, should be discussed without the aid of army medical officers experienced in the problem. Clinical coordination between civil and military medical personnel should be developed. As a result of recent intensive study on this subject, Dr. McKellar had formed the impression of the large modern hospital as a place where medical practitioners concentrated all their sick patients and their bacteria, permitted them to emit millions and millions of these bacteria, took no precautions whatever to destroy these bacteria, and then introduced more patients to be cross-infected. He referred to a recent coroner's inquest, in which the coroner expressed some doubts as to whether the medical witnesses should not be committed for operating on the patient on a kitchen table. Dr. McKellar considered that there was a case to be answered as to whether those doctors should not rather be committed who sent patients to hospital where the risk of infection was high, when they could have been operated on in the home, where the risk was much lower. On the medical side, it had been said that 70% of patients suffering from scarlet fever admitted to hospital were cross-infected with other types of streptococci than those they took with them, and that many so-called complications were but clinical manifestations of this infection. Nurses often questioned the suggestion that infection of clean wounds occurred in material amount, but overwhelming evidence was available.

With regard to the question of air sterilization, Dr. McKellar referred to a statement by Ogilvie to the effect that perhaps it was not surprising to find that in the course of a bronchoscopy the flora of a bronchus should within a few minutes be recovered from a distant part of the theatre, but it was surprising that air which had hitherto been entirely free from *Bacillus pyocyaneus* should be found to contain that organism within five minutes of the opening of an abscess in which it was present. Dr. McKellar reminded those present of the comparison drawn in Medical Research Council Memorandum Number 6 between the uncovered wound and an uncovered Petri dish. Daryl Hart stated that pathogenic bacteria given off from the noses and throats of those present in the modern, well-run operating room, floating in the air and sedimenting in the sterile field, comprised the greatest breach in the present-day aseptic technique and presented the greatest hazard of infection in large operation wounds. Hart further stated that the greatest success was obtained by the killing of these bacteria in the air and on the sterile field with ultra-violet radiation. Some of his results, expressed as reductions in the percentage of infected wounds, were the following: radical mastectomy and thoracoplasty, 38% to 0·35%; orthopædic operations, 17% to 0·7%; herniorrhaphy, 3·3% to 0; thyreoidectomy, 1·8% to 0. The results had been constant over a period of five years. Dr. McKellar went on to say that sunlight also had been shown to accelerate the rate of death of hæmolytic streptococci, and of pneumococci. He held that not enough consideration was given to the question of sunlight and fresh air in hospital construction.

Referring to sterilization of materials, Dr. McKellar said that surgeons left a great deal to the nursing staffs. He believed that a bacteriologist should supervise hospital sterilization methods, and that failure to provide that control was negligence. Dr. McKellar wondered how many surgeons were aware of what was necessary for the sterilization of sulphanilamide. Steam would not readily penetrate powder masses, and Dr. McKellar said that he had just had made a cultural investigation of the glove powder pad from an operating theatre and obtained a profuse growth of organisms, not yet identified. "Vaseline" was commonly "sterilized" in an autoclave, whereas lavage had shown that procedure to be ineffective, although *tulle gras* was rendered sterile if there was sufficient moisture in the cotton. But "Vaseline" required one hour at a temperature of 150° F., and much time had to be allowed for this heat to penetrate to the centre of the "Vaseline". During the week, Dr. McKellar had seen a theatre sister "setting up" for an operation, put out linen with her bare "scrubbed up" hands.

Turning to his fourth heading, Dr. McKellar said that he blamed pathologists largely for the existence of the cross-infection problem. He asked pathologists the following four questions: (i) How soon after tonsillectomy was it safe to perform a meniscus operation in the same theatre? (ii) Did medical patients constitute a danger to surgical patients in the same ward? (iii) If five to ten pounds' pressure for ten to fifteen minutes was enough to sterilize rubber gloves, why did it take 15 to 20 pounds' pressure for thirty minutes to sterilize dressings? (iv) Was boiling for five minutes in 2% sodium carbonate solution enough to kill spores, or to sterilize an instrument dropped on the floor of the operating theatre?

Finally, Dr. McKellar said that he believed that some concrete proposals should result from the meeting. He therefore suggested that the following steps should be taken: (i) That the meeting should approve the Medical Research Council Memorandum Number 6 and urge the adoption of its main features. (ii) That the meeting should resolve that the New South Wales Branch Council should be asked to form or control the formation of a committee on hospital infection. (iii) That such a committee should be but a subcommittee of a hospitals standardization committee on the lines of that of the American Medical Association.

PROFESSOR H. K. WARD said in answer to questions that most spores were destroyed by boiling in alkaline water for a few minutes, and that non-aqueous fluids like "Vaseline" should be sterilized by heating to 160° C. for two hours. Owing to the shortage, the sterilization of rubber gloves had been much discussed because of the rapid deterioration of the rubber if autoclaved at the usual pressure. Professor Ward believed that autoclaving at five pounds' pressure for thirty minutes was reasonably safe and prolonged the life of the gloves. Referring to masks, Professor Ward said that, in his opinion, any mask having an interlayer of "Cellophane" or paper was a sound mask, provided it covered the nose. The ordinary mask tended to slip off the nose, and it was difficult to induce surgeons and nurses to keep the nose covered at all times. The mask advocated by the Medical Research Council did not slip off the nose easily and could be interleaved with "Cellophane" or paper. Professor Ward said that the hæmolytic streptococcus, which was such a common and troublesome organism in open wounds in England, was not found so frequently in Australia during most of the year, but its incidence always rose in the late winter and early spring months. Cross-infection with hæmolytic streptococcus was commonly observed in infectious disease hospitals, and since scarlet fever was a very mild disease nowadays, it was a pity that these patients were sent to hospital. Moreover, for every patient with streptococcal tonsillitis and a rash, there was at least one patient with streptococcal tonsillitis without a rash. Both patients were equally infectious, but no one advocated sending the patient without a rash to an infectious disease hospital. Professor Ward then referred to several points of surgical technique that were not consistent with strict asepsis. One was the practice of some surgeons of palpating the area surrounding the wound with the bare hand when the wound was being dressed, thereby violating the rule that nothing should touch the wound or the surrounding skin except sterile swabs or sterile forceps. Another was the practice of rinsing the gloved hands or soaking sponges in so-called sterile water. This water usually came from a reservoir which could be heated by a steam coil, but there was no attempt to sterilize the pipe and tap which delivered the water in the operating theatre. Fortunately pathogenic bacteria were not commonly found in tap water. A more serious slip in asepsis was the failure to sterilize baths thoroughly. Arm baths could be boiled, but the full-length bath which was often used in the treatment of burns *et cetera* was usually sterilized by washing over with 5% lysol solution. This procedure had been proved to be

ineffective, hæmolytic streptococci surviving in the greasy scum that remained on the sides of the bath. A more effective method was for the nurse to put on gloves and rub the bath down with undiluted lysol. Speaking of skin disinfection before operation, Professor Ward said he agreed with Dr. Stephen when he said that undiluted "Dettol" and iodine were the only two commonly available antiseptics which were efficient.

In the general problem of surgical asepsis, Professor Ward said there were undoubtedly two standards of asepsis, a high standard in the operating theatre, and usually a much lower standard for the dressing of the wound in the ward. It was now generally agreed that the latter standard should be raised, but Professor Ward was inclined to doubt whether such a standard could be kept up week after week, month after month, unless a special room was set aside for the purpose in which a dressing ritual could be established away from the bustle and dust of a busy ward.

In concluding, Professor Ward appealed for more bacteriological control and suggested that a silent witness in the form of an exposed blood plate might well be present in the operating theatre during operations and in the ward while dressings were going on. If wounds became infected, Professor Ward hoped that some day it would be a routine practice to swab the wound and send the swab to the laboratory for a report on the flora. This information was valuable to the surgeon, not only as a guide to prevention, but also as an aid in treatment, because it was unlikely that any one antiseptic would be found which was equally active against all microorganisms.

DR. G. FENTON said that, as medical superintendent of a district hospital, he had been interested in the papers. One in administrative hospital work took a rather different view from the somewhat academic views that had been expressed. Professor Ward's remarks had a practical bearing on the subject and an intensely practical value. The question that had been running through Dr. Fenton's head was whether the economic loss due to hospital infection of wounds was greater, or likely to be greater, than the cost of preventing it—whether patients in hospitals suffered any great loss of earning power or any great pain or discomfort as a result of wound infection. It was important to know exactly what was meant by infection. Did it mean just a little redness round the wound? Dr. Fenton considered that a useful definition of infection was a condition of the wound which caused the patient to stay in hospital longer than he should have needed to stay, or cost him some economic loss. Anything at all could be done, provided the money was found. Some of the remedies that had been suggested were impracticable. For example, it had been suggested that wet tea leaves should be strewn on the floor before it was swept. Dr. Fenton said that once that procedure had been observed, it would never be suggested for use in a hospital. He went on to say that an increase in wound infection had occurred at the hospital of which he was medical superintendent. He had investigated the increase with the object of ascertaining the causes. He went into the question of the ward, the operating theatre, the theatre sister, the anæsthetist and assistants, the catgut and materials *et cetera* to try to find a common cause. There was only one common factor in these infections—curiously enough 18 out of 19 of the affected patients had been operated on in an air-conditioned theatre.

Dr. Kinsella, in reply, referred to Dr. Fenton's remarks about the air-conditioned operating theatre. He wondered whether the air conditioning included only stabilization of temperature and of the moisture of the air, or whether the air was filtered or any attempt was made to free it from microorganisms. Dr. Kinsella also wondered whether the air was conveyed to the operating theatre from near the ceiling or near the floor. Professor Ward had referred to the treating and splinting of "clean" wounds of the hand in the casualty room. Dr. Kinsella said that quite a number of those who were later admitted to hospital with infected wounds could be successfully treated by no other measures than splinting and elevation of the injured limb.

Dr. R. L. Stephen, in reply, said that the same thoughts about air-conditioning had occurred to him as had occurred to Dr. Kinsella. It seemed remarkable that air which in theory should be very much cleaner than ordinary air, should be such a source of infection.

DR. K. S. M. BROWN, from the chair, said that the subject of hospital infection of wounds had been thoroughly covered and presented in an interesting way. If the surgical consciences of those present had been allowed to relax, what they had heard should goad them into over-activity. It had been mentioned that it was regrettable that more of the members of the armed forces were not present; the subject would have been of the greatest interest to them. Dr. Brown, in conclusion, thanked those who had read the papers and taken part in the discussion.

Correspondence.

BACILLARY DYSENTERY.

SIR: We are very interested in the discussion concerning media suitable for the detection of dysenteric bacilli in your journal. If we might be allowed to express our opinion based upon the examination of 14,000 stool specimens during the last years, both sides are right.

Leifson's desoxycholate-citrate medium and its equivalent, Hynes's plate, give superior results with mannitol-fermenting Shigella strains, that is, *Shigella paradysenteriæ* Flexner-Boyd, *Shigella sonnei* and the dispar group, but the colonies are not suitable for slide agglutination tests. Moreover, coliform and Gram-positive organisms are only retarded on these plates, therefore mixed colonies are very common. The advantage of the media with desoxycholate and citrate is, that a heavier inoculum can be used.

Leifson's desoxycholate plate, the eosine-methylene blue plate of Teague *et alii*, Endo's agar, the Chesney medium, are inferior to MacConkey's plate. It is, however, little inhibitory, and is, therefore, replaced in typhoid and paratyphoid work by more selective media. On the other hand, certain *Salmonella* strains, as *paratyphi A, sendai, pullorum*, grow less abundantly on selective media; therefore MacConkey's plate should be used also in the detection of these organisms.

The S.S. medium and Gallie's agar are "intermediates". While *Shigella dysenteriæ* Shiga and most *Shigella schmitzi* do not grow on them, more *Shigella sonnei* strains can be isolated from these plates than from Leifson's desoxycholate-citrate or Hynes's agar.

Wilson and Blair's tellurite medium is definitely limited to *Shigella paradysenteriæ* Flexner-Boyd and a number of *Shigella sonnei* strains. It was found that dysenteric bacilli growing on Wilson and Blair's tellurite medium multiply also in Knox *et alii* modification of the tetrathionate broth (this modification was described in *The Journal of Pathology and Bacteriology*, Volume LIV, 1943, page 469). When the tetrathionate broth is used for the detection of typhoid-paratyphoid bacilli, Wilson and Blair's tellurite plate might be neglected. The broth has to be streaked, however, to Leifson's or Hynes's or Gallie's plate or to S.S. agar, because Knox's plate does not permit the growth of dysenteric organisms.

Finally, De Loureiro's modification of Wilson and Blair's bismuth sulphite medium (described in the *Journal of Hygiene*, Volume XLII, 1942, page 224) is an ideal medium for the detection of typhoid and hydrogen sulphide forming paratyphoid or Salmonella bacilli under difficult conditions. The most suitable series of plates, permitting the detection of all known bacillary incitants of diarrhœa, would be: (i) MacConkey's plate, (ii) desoxycholate-citrate or Hynes's plate, (iii) Knox's enrichment fluid streaked to desoxycholate-citrate or Hynes's medium, (iv) De Loureiro's modification of Wilson and Blair's bismuth plate.

Yours, etc.,

OSCAR FELSENFELD, M.D., M.S.,
Supervising Bacteriologist.

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December 6, 1943.

THE NERVOUS SOLDIER.

SIR: The problem of the nervous soldier and his future is one of very great importance and urgency, and it is much to be regretted that Professor Bostock and Dr. Evan Jones in their booklet have bemused this problem by their dangerous advice to medical officers to regard every soldier (officer and man) as a "potential exaggerator" motivated by a desire for "pecuniary gain" and further "whenever doubt arises it is wiser to consider that the man is a malingerer. . . ."

I, like the majority of medical practitioners, am interested in and conscious of the importance of psychology, particularly since having the opportunity to see some of the work of my brother in the Great War, but I confess that I am not an expert in the fantasia of present-day psychiatry.

I have been almost continuously associated with the Australian soldier for some thirty years, in active service in the field, work at the base, and in peace-time training. I have also had the unhappy experience for some years of being a medical member of assessment appeal tribunals, where it is heartbreaking to see the mental attitude to which so many men have been reduced.

But for a medical practitioner to judge the mental attitude of the Australian soldier (officer and man) by his experience of the unfortunates he meets on these tribunals is as sensible as to judge the mental outlook of the people of Australia by one's experience in a mental hospital, or to judge their morals by one's experience of prisoners in a gaol, even admitting that useful knowledge may be gained by these experiences.

As an illustration of the harmful consequence of the medical attitude recommended in the booklet, I quote an actual case.

The man was suffering from progressive nerve deafness of constitutional origin, there being a very bad family history of deafness in his nearest relatives, and actually the deafness had been noted and entered upon his papers, unequivocally, at his preliminary medical examination. His work was of the non-combatant variety, but he was compelled to attend parades. He could do his work quite well, but got into trouble on parade on account of his deafness. His medical officer stated that he was exaggerating his symptoms for some ulterior motive. This was entirely untrue; the fault lay with his superior officers for not recognizing his difficulty and with his medical officer for not explaining the circumstances.

The result was that, in spite of being an excellent type of man, his treatment aroused a very natural feeling of resentment which may quite possibly drive him into the classification of a "nervous soldier". Professor Bostock and Dr. Evan Jones, as there had apparently been doubt in this case, would probably have classed him as a malingerer; this would have been the very reverse of courageous and realistic, that is, cowardly and irrational and likely to be productive of harm to the individual and to the State.

The rhetorical question of your anonymous correspondent, "Are we not all potential exaggerators?", is a very apt criticism of the authors of the unfortunate extracts in question.

Yours, etc.,

ERNEST CULPIN.

Ballow Chambers,
Wickham Terrace,
Brisbane.
January 12, 1944.

VACCINATION AGAINST PERTUSSIS.

SIR: Brisbane's medical officer of health proposes to give 40,000,000 pertussis bacilli (Phase I) in three weekly injections as mass vaccination and asks for opinions.

Working in a general practice, I began trying to prevent whooping cough in the winter of 1941.

One hundred and forty children from six months to six years have been done up to date, and, of these, three were incubating the infection when the course was started. No injected child to my knowledge has yet developed whooping cough, although the district has never been free from it, even in summer.

Twenty seven and a half million organisms is the total injected, using Commonwealth Serum Laboratory stock preparation.

First week, pertussis vaccine, Phase IB.: 0·5 cubic centimetre = 2·5 million.
Second week, pertussis vaccine, Phase IB.: 1·0 cubic centimetre = 5·0 million.
Third week, pertussis vaccine, Phase IC.: 1·0 cubic centimetre = 10·0 million.
Fourth week, pertussis vaccine, Phase IC.: 1·0 cubic centimetre = 10·0 million.
Total: 27·5 million organisms.

Each year up to the age of six, a boost injection of ten million organisms is given. Many mothers neglect to have this done, and as no injected child has contracted whooping cough, its value is problematical.

The first injection of ten million organisms preposed in Brisbane is in my opinion high. Beginning with a quarter of this dose, no general symptoms of consequence have resulted, but many children up to the age of two years develop fairly hard lumps at the site of the injection in the upper arm. These gradually disappear. My conclusion is that there is no need to give a course of more than 25 million Phase I bacilli. The necessity for a boost of ten million organisms yearly is not established.

The injection treatment of whooping cough was begun in desperation in 1941. The results have been excellent. Forty cases have been injected; only two were complete failures. Four injections are given at four to five day intervals, and if the child is still whooping or vomiting at the time of the last injection, the experience has enabled me to tell the mother that she will be having good nights by the next week-end.

In other words, the severe symptoms are reduced from six to eight weeks to two to three weeks.

This seems worth while when one reads such opinions as that of a group of American pædiatricians who estimated that 70% of children who had been ravaged by whooping cough bore its scars in some way for life.

Discussion recently in the *British Medical Journal* discounted completely the value of injection treatment of whooping cough. My explanation for this is that treatment, to be effectual, must be begun early, and that hospital figures are not reliable because a case is usually firmly established before a mother brings it to hospital.

My explanation to the mothers of what to be on the lookout for is spasms of coughing coming on at night causing the child to become red in the face, finishing up with vomiting or whooping, and getting worse each night. By this means treatment is usually begun early, before the whoop appears. In the type of whooping cough we get here, vomiting usually precedes whooping and is much more common than whooping which may be absent. Stress is laid on the spasm of eight to twelve coughs before being able to take a breath.

Curiously, I have found it necessary to use Commonwealth Serum Laboratory's "Mixed Vaccine" for treatment. This preparation contains a small number of Phase I organisms and a relatively large (almost excessively large) proportion of secondary invaders.

Method used: four injections at four to five day intervals.

First, mixed pertussis vaccine B. .. .. .. 0·5 c.c.
Second, mixed pertussis vaccine B. .. .. 1·0 c.c.
Third, mixed pertussis vaccine C. .. .. .. 1·0 c.c.
Fourth, mixed pertussis vaccine C. .. .. 1·0 c.c.

My conclusions from treating the small number of forty cases over three winters, and declining to treat a thoroughly established case by injection, are that in over 90% of cases the severe symptoms are under control in less than three weeks.

Education of mothers regarding early symptoms is essential, so that treatment may be begun in time. This is a rather satisfying belief to have about a scourge which is always with us and common, whose death rate bears no relation to its ravages, and so in Australia may perhaps be called Public Enemy Number I.

Yours, etc.,

LEO J. GURRY, M.B., Ch.B. (Edin.).

23, Douglas Parade,
Williamstown,
Victoria.
January 17, 1944.

EXTRACTION OF CATARACT IN ITS CAPSULE (TOTAL EXTRACTION).

SIR: In his letter of January 8, Dr. R. A. de Castro Basto takes me to task for stating that "45% of his cases regained a visual acuity of $^6/_{12}$ or less". I obtained this figure by adding up the last three rows of his table of October 16, 1943—that is, the row with $^6/_{12}$, the second with $^6/_{15}$ and $^6/_{21}$, and the last with $^6/_{24}$ and less. This amounts to 18 out of 40 or 45%. It is obvious that the remainder or 55% obtained more than $^6/_{12}$. Dr. R. A. de Castro Basto apparently regards an acuity of $^6/_{12}$ or better as satisfactory. This would appear to mean that he is satisfied with a lower standard of visual acuity. It includes another six cases, and brings his percentage up to 70. It is my experience that intelligent patients are not satisfied with $^6/_{12}$ vision after a cataract extraction.

It is not my intention to decry the operation of intracapsular extraction, the technique of which Dr. R. A. de Castro Basto apparently regards as new. Like several of my

colleagues from Brisbane to Hobart, I feel compelled to protest against his unreasonable and sweeping condemnation of a sound and safe method of operation.

In any case, is it scientific or academic to draw any conclusion from the results obtained in a series of forty cases, when a balance of six is sufficient to swing the percentage of good results from 55 to 70?

As there is a display of interest in this controversy amongst those whose practice is not confined to ophthalmology, the following statements may help to clarify the issue.

1. The operation of extraction of the lens in its capsule or intracapsular extraction, has been practised for a sufficiently long time for it to be no longer regarded as new.
2. Nowhere is it more widely employed than in the Empire, particularly in India, by surgeons trained in the British Isles, and by medical missionaries. In the British Isles themselves, it is the operation of choice of many well-known ophthalmic surgeons.
3. So-called immature senile cataracts can be extracted by the older extracapsular method without any extra risk of failure. (Incidentally there is no clinical test which will determine whether the lens is really mature!)
4. Evidence of past inflammation of the iris and of the ciliary body is not a contraindication to operation by this method.
5. Complications are by no means the rule after the extracapsular operation. The usual length of the stay in hospital is ten to fourteen days.
6. It is not necessary to needle every case.
7. The technique of the intracapsular operation is more difficult to acquire. It is more dangerous in inexpert hands.
8. A comparison of the results obtained does not demonstrate the superiority of either method.

Yours, etc.,

KEVIN O'DAY.

33, Collins Street,
Melbourne, C.1,
January 19, 1944.

THE PRACTICE OF RADIOTHERAPY AND THE FUTURE OF CANCER TREATMENT IN AUSTRALIA.

SIR: I read with very great interest the letter from Dr. Eric W. Frecker in your issue of January 15. The more consideration I give the subject the more I am inclined to support Dr. Frecker's contentions all the way along the line.

First, as to the establishment of a monopoly of cancer treatment by an institute in each State of the Commonwealth: Although this project, as advocated so eloquently by Dr. J. Ralston Paterson, seemed to have many advantages, the idea of practically restricting treatment of private patients with cancer to the permanent officials of the cancer clinic to the exclusion of all competition by private practitioners has, I think, some dangerous potentialities. Although it is quite probable that the first staff appointed to the cancer clinic will be energetic, up to date and ready to learn new methods, it is, I think, also very probable that before very long errors will be made in the selection of office bearers, and as a result the treatment will become stereotyped and unprogressive. Such degenerative changes are always prone to occur where the stimulus of outside competition is not felt. I, therefore, regard it not only as desirable but essential that outside competition by private practitioners should continue to exist. Such private practitioners will not be able to make the treatment pay unless they are very well trained. If they are very well trained, it is a great pity that their services should be denied to cancer patients who can afford private fees.

The information provided to Dr. Frecker that private practitioners would only use their experience gained in the institute in competition with the institute is, of course, very bad doctrine. The institute should be a teaching body and rejoice in the fact.

I, therefore, feel very strongly that, while it is desirable to establish a cancer clinic with whole-time radiotherapeutic officers, it is also essential that competition by private practitioners should be permitted and even encouraged in the sure and certain hope that by such means the standard of work in the institute will continue to be of high value and progressive in nature.

The other point that I want to stress is that in some respects conditions are very different in Australia from what they are in England. Dr. Goldschlag from Poland and Lieutenant-Colonel Brandon from Holland, who have seen the dermatological clinics in this country, state without hesitation that the frequence of carcinoma of the skin and lip is not less than ten times and probably twenty times that at which the same diseases occur in European countries. Practitioners, especially in dermatology, in Australia always have had to deal with a very large number of cases of carcinoma of the skin and lip. As a result of this they have become to a notable extent more radiotherapeutically minded than is the case with the men practising that specialty in England. From my own personal experience with dermatological colleagues working in England and other European countries I can say that very few of them have any real radiotherapeutic knowledge, a fact which they admit quite frankly. Some of them have X-ray machines of very small power which they use with great timidity. Most of them treat such cases of carcinoma of the skin which come to them with radium plaques in a more or less desultory manner, or refer them to surgeons or radiotherapists. Dermatologists in Australia, however, have been forced by circumstances into becoming expert in the treatment of these conditions by radiotherapeutic means. It can be stated without fear of contradiction that the very low death rate from carcinoma of the skin and lip, in spite of the enormously high incidence of these diseases in Australia, is a testimonial to the skill with which these tumours are treated in this country. If the results of treatment of carcinoma of the skin and lip were not excellent there might be some reason for suggesting a change. It is, however, highly dangerous to desert a well-tried procedure for one which even at the best can hardly be expected to provide better results.

I feel sure that the suggestion made to the effect that a full-time radiotherapeutic officer should go round the country centres and collect cases of cancer of the skin and lip for treatment in Sydney at the cancer clinic is highly undesirable. Such an officer would have to be not only a radiotherapist, but a skilled dermatologist, or all sorts of other conditions, like *lupus erythematosus* and syphilis, for example, will be caught in the net quite unnecessarily.

In this matter there is still one other important point, and that is the subject of cost. Strange as it may appear, it is definitely cheaper for a patient with a skin or lip cancer to be sent by his family doctor in the country to a specialist in Sydney as a private patient than it is for that patient to be sent to a public clinic. The reason for this is that the fee for treating a small skin cancer in private practice can be kept as low as five guineas if necessary. The treatment can be done in the day, and the patient can return the same evening to his farm or other occupation in the country. If he goes to a hospital or to the cancer clinic, he will be seen first by a junior officer, referred next day or next week to a senior officer or committee, who will decide that he is to be treated the next day, or perhaps next week. The cost to the patient or the State is much more in living expenses and board and lodging than is the case if the private fee is paid and the patient is allowed to return home immediately. I think this is important, and, as far as I know, the cost cannot be equalled by any institutional method of treatment of this disease.

I, therefore, plead that people who have done such good service to the community in the past in the very efficient treatment of skin and lip carcinoma should still be entrusted with the treatment of these diseases which they have handled so well and so cheaply during the last twenty years.

Yours, etc.,

E. H. MOLESWORTH.

Beanbah,
235, Macquarie Street,
Sydney.
Undated.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Numbers 13, 19 and 24, of January 20 and 27 and February 3, 1944.

NAVAL FORCES OF THE COMMONWEALTH.

Permanent Naval Forces of the Commonwealth (Sea-Going Forces).

Promotion.—Surgeon Lieutenant (D) Sydney Joseph Leon Abraham is promoted to the rank of Surgeon Lieutenant-Commander (D), dated 7th February, 1944.

Citizen Naval Forces of the Commonwealth.

Royal Australian Naval Reserve.

Grant of Honorary Rank.—Cyril Howard Shearman is granted the honorary rank of Surgeon Commander, dated 15th December, 1943.

ROYAL AUSTRALIAN AIR FORCE.

Reserve: Medical Branch.

Squadron Leader W. F. H. Crick (251502) is transferred from the Active List with effect from 20th December, 1943.—(Ex. Min. No. 28—Approved 19th January, 1944.)

Percy Byron Houghton (257600) is appointed to a commission on probation with the rank of Flight Lieutenant for part-time duty with effect from 15th November, 1943.—(Ex. Min. No. 31—Approved 26th January, 1944.)

CASUALTIES.

ACCORDING to the casualty list received on February 7, 1944, Major D. W. Brummitt, A.A.M.C., is reported to have been wounded in action.

According to the casualty list received on February 9, 1944, Captain L. E. Tansey, A.A.M.C., of Bellevue Hill, New South Wales, who was previously reported missing, is now reported to have been accidentally drowned.

Medical Appointments.

His Excellency the Governor in Council has been pleased to reappoint Arthur Murray Cudmore, C.M.G., F.R.C.S., to be President of the Medical Board of South Australia.

His Excellency the Governor in Council, South Australia, has been pleased to reappoint Professor John Burton Cleland, M.D., Ch.M., to be a member of the Aborigines Protection Board for a period of four years.

Dr. Norman Gregory Joseph Behan has been appointed medical officer, Department of Health and Home Affairs, Queensland, in pursuance of the provisions of *The Health Acts*, 1937 *to* 1943, and *The Public Service Acts*, 1922 *to* 1924.

Dr. William Edward Lodewyk Hamilton Crowther has been appointed to the Millbrook Home Board, Tasmania, for a further period of two years, in accordance with the provisions of Section 4 of the *Psychopathic Hospital (Management) Act*, 1933.

Dr. Edmund Harold Molesworth has been appointed President of the New South Wales Medical Board.

Dr. John Joseph Witton Flynn has been appointed a member of the New South Wales Medical Board.

Nominations and Elections.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Cambourn, Paul, M.B., B.S., 1943 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Obituary.

JOHN RAMSAY.

WE regret to announce the death of Sir John Ramsay, which occurred on February 6, 1944, at Launceston, Tasmania.

Books Received.

"A Textbook of Pathology, General and Special, for the Use of Students and Practitioners", by J. Martin Beattie, M.A. (N.Z.), M.D. (Edinburgh), D.Sc. (*honoris causa*), National University of Ireland, M.R.C.S., L.R.C.P. (London), and W. E. Carnegie Dickson, M.D., B.Sc., F.R.C.P. (Edinburgh), with the collaboration of A. Murray Drennan, M.D., F.R.C.P. (Edinburgh), F.R.S.E., and John O. Oliver, M.B., B.S. (London), M.R.C.S. (England), L.R.C.P. (London); Fourth Edition; 1943. London: William Heinemann (Medical Books) Limited. 9½" × 6¾", pp. 1381, with over 800 illustrations and 19 coloured plates. Price: 84s. net.

"Pasteurisation", by Harry Hill, F.R.San.I., A.M.I.S.E., F.S.I.A.; 1943. London: H. K. Lewis and Company Limited. 8½" × 5½", pp. 158. Price: 10s. net.

"The Biologic Fundamentals of Radiation Therapy: A Textbook", by Friedrich Ellinger, M.D., with a preface by Maurice Lenz, M.D. English translation by Reuben Gross, M.D.; 1941. New York: Elsevier Publishing Company, Incorporated. Distributors: Nordeman Publishing Company, Incorporated. 9¼" × 6", pp. 374, with illustrations. Price: $5.00.

"Recent Advances in Medicine: Clinical Laboratory Therapeutic", by G. E. Beaumont, M.A., D.M. (Oxon.), F.R.C.P., D.P.H. (London), and E. C. Dodds, M.V.O., D.Sc., Ph.D., M.D., F.R.C.P., F.I.C., F.R.S. (Edinburgh), F.R.S.; Eleventh Edition, 1943. London: J. and A. Churchill Limited. 8" × 5¼", pp. 424, with 43 illustrations. Price: 18s.

"The Woof of Life", by I. Harris, M.D.; 1943. London: Longmans, Green and Company. 7¼" × 5", pp. 115. Price: 7s. 6d. net.

Diary for the Month.

FEB. 14.—Victorian Branch, B.M.A.: Hospital Subcommittee.
FEB. 14.—Victorian Branch, B.M.A.: Finance Subcommittee.
FEB. 15.—New South Wales Branch, B.M.A.: Medical Politics Committee.
FEB. 15.—Victorian Branch, B.M.A.: Organization Committee.
FEB. 17.—Victorian Branch, B.M.A.: Executive Meeting.
FEB. 22.—New South Wales Branch, B.M.A.: Ethics Committee.
FEB. 23.—Victorian Branch, B.M.A.: Council Meeting.
FEB. 25.—Queensland Branch, B.M.A.: Council Meeting.
FEB. 26.—Tasmanian Branch, B.M.A.: Annual Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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